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Canadian Dairy Industry.

THE PRINCIPAL item in Canada's exports of dairy products is cheese, valued in 1929 at £3,700,000, the greater part of the trade being transacted with the United Kingdom, which purchased 87 per cent. of the exports. Butter exports have been small for several years, but considerable quantities of condensed and evaporated milk and of milk powder are exported annually, markets being found in twenty-five different countries.

The consumption of cheese, milk, and ice-cream is increasing in Canada. In 1921 the average used per head of population was 2·51 lbs. of cheese, 240·1 lbs. of milk, and 5·26 pints of ice-cream. In the following seven years this increased to a *per capita* consumption of 3·54 lbs. of cheese, 470·8 lbs. of milk, and 7·05 pints of ice-cream.

Factory cheese production in Canada in 1929 amounted to 118,746,286 lbs., valued at £4,300,000 (approx.), as compared with 144,584,619 lbs., worth £6,100,000 (approx.), in the previous year. The record cheese production in Canada was 220,833,269 lbs. for the year 1900, since which year the annual returns have shown a steady decline, due to the increasing use of the available milk supply in the manufacture of butter and for home consumption as whole milk. Ontario production in 1929 represented 67 per cent. of the total output for Canada, that of Quebec reaching 30 per cent. of the total.

The tendency in the Canadian dairy industry in recent years has been towards the consolidation of plants for the manufacture of butter and cheese, with a consequent decrease in the total number of factories and an increase in the average size of the factories. Thus it is hardly surprising that there has been a remarkable decline in the number of factories during the past generation, the number recorded for 1900 being 3,576 and for 1929 only 2,797. The number of dairy factories operating in 1929 included 1,213 creameries, 1,273 cheese factories, 281 combined butter and cheese factories, and 30 factories engaged in the manufacture of condensed and evaporated milk, milk powder, and other concentrated milk products.

The Dominion Bureau of Statistics at Ottawa has forwarded to the High Commissioner for Canada in London its final Report containing Statistics of Canadian Dairy Factories for the year 1929, a copy of which can be consulted at Canada House, Trafalgar Square, London, S.W. 1, by persons interested.

British Honey.

Under the heading of "Current Literature" will be found some comments on a report of the marketing of honey and beeswax issued by the Ministry of Agriculture and Fisheries. We note that one of the conclusions reached is that the large quantities of imported as compared with home-produced honey sold in Great Britain, and still more the relatively low level of total consumption, indicate that there is *vast scope* for expansion of home production.

The consumption in the United Kingdom is about ¼ lb. per head of population per annum, and is abnormally low compared with that, for example, in Canada and New Zealand. Of this, only one-quarter is produced in this country.

Overseas producers are devoting considerable attention to the promotion of sales on the British market. Thus, in New Zealand and Australia are established comprehensive marketing boards, acting either as trading or regulatory bodies in the interests of all producers. Similar publicity in favour of the home product is necessary if British bee-keepers are

to secure a substantial share of the valuable trade in the big markets now largely in the hands of their competitors—but there will have to be concerted action among the home producers.

Collective publicity based on a standardised product would not do more than create the required demand. Collective sale may be needed to enable that demand to be met.

Other desirable means for stimulating the industry are the provision of an efficient system of market intelligence, and the use of the National Mark, with standard honey grades, to ensure reliability of quality.

Food Fads by Wireless.

The use of broadcasting talks for faddist propaganda is worthy of a spirited protest in the name of sanity, fair-play, and the proper use of public money. In a talk on "The Art of Cooking and What is Wrong with British Cooking" one would expect to receive some useful instruction as to correct methods and common faults; instead of this, the speaker made it an opportunity for yet another tirade against white bread! One became rather tired of the recent white and wholemeal bread controversy in the sensationalist Press, where completely erroneous and biased statements were frequently made, and it certainly will be boring in the extreme if the whole business is gone through again in wireless talks. Nobody really sensible condemns white bread and nobody rational condemns properly cleaned and well-milled wholemeal flour. It is purely a matter of personal taste and the consumers' roughage requirements. It does, however, seem unfair for the B.B.C. to allow one side of a controversy to be ventilated without giving an opportunity for a counterblast. It is satisfactory to note that our contemporary, *Milling* (usually mild in temperament), has also risen in indignation, and we hope the B.B.C. will, in all fairness to the public, seek out someone who champions the cause of white bread to broadcast its virtues; but if so, it is the truth we want, not inane faddism, which does more harm than good.

Fat Content of Cheese.

In a report presented by P. Sajou to the Congress of French Gruyère Cheese Producers, it is pointed out that the French law of 1924 relative to the fat content of cheese makes no reference to gruyère. Eighteen samples of French manufacture have been examined, and fourteen found to have a fat content of 45 per cent., the remaining four containing from 40 to 45 per cent. As these samples can be taken as representative, it may be inferred that French gruyère contains over 45 per cent. of fat on the dry matter, and could be classified as "extra fatty," while those containing 40 per cent. could be described as "fatty." Gruyère with a fat content of below 40 per cent. would represent only a very small proportion of French production.

Cheese Ripening.

Ripening of cheese is a bacteriological and chemical reaction influenced by temperature and time plus many additional factors, depending upon the variety of cheese. In an American contemporary, *Food Industries*, May, 1931, R. L. Flint remarks that aside from improvement in quality of milk, progress in stabilising quality in cheese has advanced to the extent that makers have learned to co-ordinate the control of temperature, bacteria, and moulds. The texture and flavour of cheese are influenced to a large extent by its ripening. Many types of bacteria are present in cheese curd, some of which may be introduced by the maker as an aid in developing the desirable features in the kind made. All are influenced by the temperature and humidity at which the cheese is held. Refrigeration or temperature control, therefore, is an important feature in ripening cheese. The term "refrigeration" as here used refers to temperatures above rather than below the freezing-point, as freezing is generally considered detrimental to its texture.

It is interesting to note that a series of studies on cheese ripening are in progress at the University of British Columbia, Vancouver, Canada, and that in this connection a note on the nitrogen distribution in Kingston cheese-ripening appeared in a recent issue of *Nature* (p. 705, May 9, 1931).

British Canning.

A circular dated May 12, issued by the Ministry of Agriculture and Fisheries, reporting the striking progress of the National Mark scheme as applied to canned home-grown fruits and vegetables, is yet another illustration of the growing tendency of Government departments to engage in active and constructive participation in the struggle of industrial progress.

The phenomenal growth of the canning industry (about which we hear so much, but, for some extraordinary reason, are left guessing at definite, authentic statistics) is best appreciated from the following data (in spite of their "baldness" and lack of detail—one has to point to U.S.A. as an example of how economic statistics should be collected and made available for general consumption): Two years ago there were only five firms engaged in canning home-grown fruits and vegetables; to-day there are nearly forty well-established firms, some

with several large factories. In 1928 the total estimated output of home-grown fruits canned in England and Wales was 96,000 cwts.; in 1929, 166,000 cwts.; and in 1930, 291,000 cwts. (see review of E.M.B., No. 37, under "Current Literature" in this issue). This, of course, is insignificant when compared with the total imports for 1929 of 3,151,000 cwts., made up of (*a*) 1,954,000 cwts. (or 62 per cent.) of canned or bottled fruits preserved in sugar (chiefly peaches, pears, and apricots); (*b*) 766,000 cwts. (or 24 per cent.) of canned pineapples; and (*c*) 431,000 cwts. (or 14 per cent.) of canned or bottled fruits preserved without sugar (mainly fruit pulp and canned apples). However, it shows the vast scope there is for the development of British canning.

Another point of interest. The chief sources of supply of the main fruits preserved in sugar were in 1929: Pineapples—Malaya 84, Hawaii 13, and South Africa 2 per cent. respectively; other fruits—U.S.A., 87 per cent., and Canada, Australia, and South Africa together, 9 per cent.

Undoubtedly a large market awaits our canned goods in Empire countries, and particularly in East Africa, South Africa, and the East. One company has built new factories at Evesham, Spalding, and Paddock Wood, and hopes to attain an annual output of 20 million cans of fruit and vegetables. Arrangements are also being made by another leading firm to make extensive additions to their Worcestershire plant and to erect a factory in Kent. Another firm is also expanding in Kent.

The National Mark.

The rapid growth of British canning has been helped very considerably by the successful introduction, in June, 1930, of the National Mark scheme by the Ministry of Agriculture and Fisheries. It has drawn public attention to the particular virtues of these products, and by ensuring a uniformly high standard of quality has engendered confidence on the part of the consuming public. Over half the total production has been packed under the Mark, and, encouraged by this success, the Ministry of Agriculture has extended the scope of the scheme for the coming season. Furthermore, it is hoped to work out a plan to embrace, in addition to quality of the fruit and vegetables, such factors as the sizes of cans, the weight of fruit content, and the strength of syrup. It has been decided to introduce a limited measure of standardisation into the National Mark scheme in the 1932 season, restricting its application to the four sizes of cans in general use—namely, A.10, A.2½, A.2, and E.1, with an option to individual authorised canners to use a fifth small-sized can.

Two other important problems being investigated by the Ministry are the lacquering of cans and the vacuum space. It has been decided to standardise the former and to require its use for red and blue fruits and for peas and beans.

Imported Bacon.

The imports of bacon into this country continue to increase. The total imports in 1930 amounted to 9,189,757 cwt., which is an increase of 911,636 cwt. over 1929 and 335,879 cwt. over 1928. The bacon came from the following countries: Denmark, 6,117,866 cwt.; Sweden, 550,692 cwt.; Netherlands, 842,848 cwt.; U.S.A., 478,342 cwt.; Irish Free State, 330,679 cwt.; Canada, 99,122 cwt.; and other countries, 770,208 cwt.

It is a remarkable fact that the production of bacon in this country is not considerably higher than it is. When one considers the enormous amount of home milling which takes place and the relatively low price of millers' offals—or wheat feed as the official title for middlings or thirds now is—it is surprising that farmers do not breed more pigs. It would appear to be a far more profitable proposition, and one which would entail far less labour and be less dependent on the vagaries of the English climate, than growing wheat, particularly at the present low value of wheat. The low value of wheat appears likely to persist for some considerable time—at any rate until the big surpluses are worked off. We are well aware that much attention has been focussed on the possibility by the Pig Industry Council and other bodies, but we feel that, even so, the whole matter has not been investigated as fully as it might be. We have published from time to time articles by authorities on various aspects of the pig industry, and a perusal of these, coupled with the magnitude of the imports of bacon, makes one feel that there is a lot of money to be made from the pig if the problem is attacked in the right way.

Spray-dried Milk Powder.

Lampitt and Bushill have recently published some interesting work on the fat in spray-dried milk powder. They regard "free" fat as the fat extractable under standard conditions by organic solvents. On spray process milk, calculated on total fat, the "free" fat varied between 3·33 and 14·22 per cent., whereas on roller process powder it was between 91·6 and 95·8 per cent. If the surface of the spray process particles is increased by grinding for three hours the "free" fat may be increased up to 83 per cent. of the total fat, but the fat is practically all "free" in the roller process powder. According to the authors, the reason for these differences is that when milk powder absorbs moisture it first becomes clammy and at the next stage is distinctly dry, hard, and powdery to the touch, and this corresponds to the freeing of the fat. The definite range of moisture content (about 8·6 to 9·2 per cent.) at which the

fat is freed is called the critical moisture content, and is accompanied by the crystallisation of the amorphous lactose in the spray process milk, but, apparently, a freshly made powder reacts more slowly than an older one. On drying out such absorbed moisture, the powder does not revert to its original state, and the critical moisture range, while independent of the fat content as such, was found to be proportional to the amount of solids, not fat, in the powder. Apparently lactose in its amorphous state has a marked effect on the availability of the fat to solvents, and crystallisation of the lactose appears to result in freeing the fat.

Pasteurised Milk.

Pasteurised milk sometimes shows varying behaviour on storage. This was particularly noticed during last summer at the central dairy at Milan, where the milk was being stored at 20° to 30° C. The alteration occurred in most cases after forty-eight hours, and a firm compact curd was formed, and there was an increase in acidity, but in some cases a change took place after twenty-eight hours with the formation of a soft flocculent curd. On investigation it was found that firm curds showed a preponderance of lactic organisms and acido proteolytic coccus forms, whereas the soft curds showed mainly acido proteolytic bacilli which are facultative thermophilic organisms of the *Subtilis* group. These are among the most injurious micro-organisms to pasteurised milk, and, in order to prevent their development during the cooling subsequent to pasteurisation, it is essential to effect this cooling to below 10° C. as rapidly as possible. This investigation is of the utmost importance in the preparation of pasteurised milk.

Grading of Milk.

Since the introduction of the methylene blue (reductase) test by Barthel and Orla Jensen, much work has been carried out on the perfecting of this rapid method of grading milk supplies. Its advantages are obvious in those cases where facilities are not available for a bacteriological examination. It also enables a creamery or milk depot to pay for milk on the basis of keeping quality as well as percentage of butter-fat. The test depends on the reduction of the methylene blue to its leuco compound by bacteria present in milk, and by a study of the rate of colour fading a measure of the amount of bacteria present is obtained. It is important, however, to remember that it does not indicate the types of bacteria present, and for useful grading the test should be done in conjunction with the fermentation test. This is especially important in the manufacture of cheese. It should be noted that the same results are by no means obtained by the two tests. Thus milk rich in bacteria will often be good in the fermentation test and milk containing few bacteria bad in the same test, so it is necessary to do both tests. If the reduction test is bad it is mainly due to defective cooling and mixture of several batches of milk before the latter are completely cooled. If the fermentation test gives a bad result, the causes are mainly indigestion in the cows, diseases in the udders, fermented fodder, and unclean milking. A first-class grade of milk should retain its colour in the reductase test for five and a half hours. If the colour does not persist more than twenty minutes the milk is decidedly bad. There have been many criticisms of the utility of this test, but in the hands of a careful worker it is of considerable value. Incidentally, it is interesting to note that it is used extensively in Canada and the U.S.A. for determining the stability of sewage effluents. In this country reliance is mainly placed on an incubation test in conjunction with the oxygen demand of the sample, but there is no doubt that the methylene blue test is of assistance in distinguishing between the relative stability of a number of effluents.

Dry Milk.

Many people seem to be under the impression that dried milk is something new and revolutionary. We have heard bakers and confectioners holding forth against the use of these "new-fangled" products. The art of drying perishable foods for storage or transportation is far from new. The American Indians dried the meat of buffalo and deer, and dried fish and fruits have been used in many countries for centuries. Marco Polo in 1298 wrote that the Tartars dried milk for the use of the army. Their method was to boil the milk and then to skim off the creamy part and put the remainder out in the sun to dry. Every soldier on starting a journey was given about ten pounds of this dry skim milk. Half a pound was "put every morning in a leathern bottle with as much water as is thought necessary. By their motion in riding the contents are violently shaken and a thin porridge is produced, on which they make their dinner." The first commercially usable process, however, did not arrive until 1855, when Grimwade patented in Great Britain a method which required the addition of carbonate of soda or potash and cane sugar before drying on rollers. Later, dried milk consisted of a combination of milk and malt extract, giving the well-known malted milk. About 1898 milk was successfully dried without the addition of any foreign substances, and since then development has been rapid, and in 1927 the production of dry skim milk in the U.S.A. alone was over 100,000,000 pounds. The old sun-dried method of the Tartars has given place to vacuum rolls, spray systems, and belt systems; but although the methods now used are more hygienic and mechanically improved, the principle is not new by any means.

The British Cheese Industry

There is plenty of room for improvement and expansion, but the accomplishment entails putting into vigorous operation the proposals advocated below.

THE APPEARANCE last year of the Report on the Marketing of Cheese (Ministry of Agriculture and Fisheries, Economic Series, No. 22) has made available for the first time a comprehensive survey and analysis of the present position of the British cheese industry. It is clear from the Report that scope exists for a wider expansion of this industry, and it is upon the data and recommendations presented there that the following article is based, supplemented, however, by information generously supplied by Professor R. Stenhouse Williams, Dr. E .C. V. Mattick, Dr. W. L. Davies, and Miss D. V. Dearden, of the National Institute for Research in Dairying, Reading; A. Todd, of the British Dairy Institute, Reading; Professor R. A. Leitch, J. F. Blackshaw, O.B.E., J. Robinson, F. W. Foulkes, and F. Grove-Palmer, F.I.C.

A perusal of the Report leads to conclusions which may be briefly stated as follows:

1. Of the total consumption of cheese in Great Britain, less than one-quarter is home-produced; of the rest, New Zealand and Canada together furnish over 90 per cent.

2. One-third only of home-produced cheese is made in the factory; on the other hand, practically the whole of the cheese imported from the Dominions is a factory product.

3. The consumption of cheese per head is in Switzerland two and a half times greater and in France one and a half times greater than the amount for this country.

4. The home farm product meets a specialised demand, and its quality and price are higher than those for the best imported products, but the average quality of the latter is superior to that of the home creamery product.

5. However, the home farm cheese suffers from lack of uniformity and dependability, and the factory product from inferior quality.

6. Also the British cheese industry as a whole is hampered by its unorganised condition in respect of collective purchase of milk supplies, collective marketing, advertising and publicity to stimulate increased demand, means for ensuring a more uniformly high quality, the inadequacy of technical research, and the failure to regard cheese manufacture as a branch of chemical engineering.

Below we give a summary of the data in support of the conclusions embodied in Nos. 1, 2, and 3 of the above, since it is important to have a quantitative statement of the position as regards production, exports, imports, and consumption.

Production.—The production of cheese in this country may be gauged from estimates made in respect of the years 1924 to 1925. (See the Agricultural Output of England and Wales, 1925, Cmd. 2815/1927, and the Third Census of Production, 1924.)

	Cwt.
Farms (1925):	
England and Wales	502,000
Scotland	145,000
Total for Great Britain ...	647,000
Factories (1924):	
Total for Great Britain ...	210,000

This post-war production of 857,000 cwts. per year represents a probable increase of about 15 per cent. above that recorded in the 1907-1908 Census of Production, the increase being in the factory output.

Exports.—Previous to 1924 some 8,000 cwts. of home-produced cheese were exported; since then the exports have increased, reaching 57,000 cwts. in 1929.

Imports.—Since the war the imports have gradually increased from 2,633,000 cwts. in 1922 to over 3,000,000 cwts. at the present time. The two main sources of supply are New Zealand (52 per cent. of total imports) and Canada (32 per cent.). The Netherlands contribute 6½ per cent. and Italy 4½ per cent. approximately..

Consumption.—The consumption of cheese in Great Britain amounts to between 9 and 10 lbs. per head annually. It is curious that in New Zealand, the source of the bulk of the cheese eaten at home, the consumption is only 5·8 lbs. per head; in Canada it is still less, amounting to only 3 lbs; while in Switzerland and France the *per capita* consumption is 23·3 lbs. and 13·5 lbs. respectively.

Requirements for Progress.

If now the facts summarised above be considered in the light of statements 4, 5, and 6, there should be no room for doubt as to the scope which exists for a wider expansion of the British cheese industry. To bring this about is, of course, no easy matter, and analysis will show that we have to deal with a complex problem involving many factors, such as

marketing, distribution, publicity, milk supply and its background of agricultural problems, competition from overseas supplies, the degree of concerted effort, the improvement and maintenance of average quality, and so on. We are not qualified, nor have we the space, to examine the problem in all its various aspects, but if any material, permanent progress is to be made someone will have to do it, and the cheese industry should be grateful to the Ministry of Agriculture and Fisheries for having taken the first step in this direction by issuing last year the above-mentioned publication. This should be read by everyone interested in the welfare of the industry, and its extraordinarily low price of 6d. (for 153 pages of valuable information gathered from a wide variety of sources, carefully checked, sifted, and arranged, representing a great amount of painstaking labour) brings it well within the range of everyone. There is no excuse, therefore, that the ground has not been surveyed, that the results have not been made available to all, and that the way along which progress should be made and effort directed has not been clearly indicated. One thing we would insist on emphasising here is the necessity, first and foremost, for concerted effort on the part of all those in any way concerned in the industry as a whole. Without co-operative action, and unless the broad and long view is adopted, British cheesemaking will continue to flounder about as one of the muddle-headed stragglers of industrial progress.

Quality Improvement and Maintenance.

Setting aside generalisations, we will take up for brief consideration one aspect of the question which is of more direct interest to us as manufacturers—namely, the improvement and maintenance of average quality. The higher the quality, the better the price obtained—within limits, of course; also, the greater the demand for British cheese, the more capable will it be of standing up to overseas competition. The best class of British cheese is better than any other—but it suffers from variability. A reputation for quality, coupled with an equally good one for dependability in maintaining a uniformly high standard, is obviously essential. Experience in other branches of industry has shown that there is only one way of improving and maintaining the quality of manufactured products, and that is by the adoption of the scientific attitude, getting to know all there is to be known concerning the materials and processes involved, and subjecting them to organised control. Admittedly this is a big proposition to tackle in the case of a product where quality comprises a number of ill-defined factors incapable of being measured and evaluated with any degree of precision (in which respect it is unlike steel, for instance) and in the production of which ill-defined strains of bacteria play a predominant part, and, again, a product possessing special characteristics according to the particular district in which it is made—*e.g.*, Cheddar, Cheshire, Lancashire, Derby, Wensleydale; still, there would be no scientists if all riddles could be solved by guessing, and if a tenth part of the intelligence that has been devoted to evolving the Einstein Theory, for example, could be induced to focus itself on the mysteries of a lump of cheese, we should begin to feel we were "getting a move on" at last.

Thus it is largely from the standpoint of scientific control that the future prosperity of the British cheese industry must be considered.

For the successful pursuance of this policy an essential requirement is adequate provision for (1) scientific research into basic principles, (2) technical research under factory or semi-factory conditions, (3) the application to practice of the results of research, (4) the instruction of those engaged in the industry as to the accumulated knowledge gained by research and experience, and (5) the adoption of a scheme of grading and marking.

In order to form a rough estimate of the extent to which these conditions have been fulfilled in the case of the cheese industry, a brief survey of the present position will be made.

Research.

The *National Institute of Research in Dairying* is the most important centre in the country for research in dairying, and is under the direction of Professor R. Stenhouse Williams. Here much valuable work has been carried out in connection with Stilton cheese manufacture with, for example, the object of overcoming the yellow discoloration which leads to serious losses. The causative bacteria having been identified, the remedy was found in the use of a suitable starter and the control of acidity. The work illustrated the extent to which *p*H may modify the reactions produced by a particular organism. Stilton

Cows awaiting Milking on a Canadian Farm.

(By courtesy of the Quebec Ministry of Agriculture.)

is perhaps the most paying of all cheeses, if all goes well. It may fetch from 1s. 6d. to 2s. per lb. in the market, but if the "blue" fails to materialise as it should the losses are heavy. The Research Institute has shown how the growth of the blue spores in *Penicillium roqueforti* is influenced by the acidity of the medium, and that the critical acidity for "blueing" is much lower than that for growth. The preliminary studies of the ripening before the appearance of the "blue" and of faults in manufacture will, it is hoped, lead to a standardisation of methods and a greater certainty of results. There is a ready market for all the first-class Stilton obtainable.

Another investigation was concerned with the use of pasteurised milk in Cheddar cheesemaking (see *Journal of Dairy Research*, Vol. I., No. 2, May, 1930, pp. 149-167).

Needless to say, the quality of the milk has a profound effect on cheese quality. The milk as produced contains micro-organisms whose presence is felt when the cheese is ripe. Some produce sweating, others "red spot." This fault is not very widespread just now, but it is a peculiarity of cheese that an epidemic might break out at any time, and in the past it has been responsible for considerable losses. The results of these researches are to be found in *Jour. Dairy Res.*, Vol. I., No. 1, November, 1929, p. 50; Vol. I., No. 2, May, 1930, p. 136; and Vol. II., No. 2, p. 190.

Some interesting work has also been carried out at Shinfield on the rôle of calcium in the renneting process and the effect of heat upon the rennin coagulation (see *Jour. Dairy Res.*, Vol. II., No. 1, p. 68).

No one feels more keenly the urgent necessity for pushing on with work of this character than does Professor Stenhouse Williams; he realises that only a modest beginning has yet been made in attacking a big field of difficult problems, and it appeared to us during a visit to the Institute that the staff and resources were totally inadequate for the work to be done. Indeed, we were surprised that so much had been accomplished under existing conditions. If ever there was good cause for wholehearted support on the part of industry, it is surely to be found in this instance.

Nevertheless, even under these conditions, an ambitious research campaign has been planned. It embraces investigations concerned with devising ways of measuring texture and other characteristics in the make-up of "quality." It also includes experiments to determine the *p*H of ripening cheese, and an attempt has already been made to follow the *p*H inside cheeses by their manufacture from milk containing indicator dyes. It is probable that the most important conditions governing the flora of a ripening cheese are (1) the available sources of carbon and nitrogen, (2) the acidity, and (3) the oxidation-reduction potential. It is suggested that the sudden development of a typical bacteria in cheese with the production of faults may be intimately bound up with the oxidation-reduction potential of the cheese.

As regards bacterial degradation of protein, Professor Stenhouse Williams notes that differences of opinion still exist upon the absolute rôle of the lactic acid bacteria in hard rennet cheese. It has been claimed that these types are able to break down casein in the way in which it is broken down in cheese. For this to be so it must be shown that they are able to degrade casein under the conditions which are present in cheese—*i.e.*, an acid reaction, a low oxidation-reduction potential, and with the

A Fine Eastern Canadian Farmstead.

(By courtesy of the Quebec Ministry of Agriculture.)

Instruction in Cheese Making at The British Dairy Institute, University of Reading.

accumulation of the end products of metabolism. The associative effect of the lactic acid bacteria with other types such as cocci, which are always present, and with the rennet, should be investigated.

It is possible that the ripening of Cheddar cheese may be due entirely to the enzymes present in the rennet, and that the function of the lactic acid bacteria is merely to produce the required acidity necessary for the activation of the rennet enzymes and for the matting of the curd, and to repress undesirable micro-organisms. Experiments to determine the rôle of rennet in the ripening of cheese are being attempted. Rennet contains pepsin and rennin, and it is intended to make cheese in which one of these has been destroyed in order to find out the exact rôle of these in the ripening of the cheese. Cheese so made will be compared in respect of the rate of ripening, etc., with cheese made similarly with whole rennet.

The Kilmarnock Institute.—Turning to Scotland, we find that important work has been carried out under Professor Leitch at the Kilmarnock Institute of the Glasgow and West of Scotland Agricultural College, notably that concerned with the origin of "black spot" in cheese. This work showed that the discoloration was due not to bacterial action but to the presence of minute quantities of lead, one part in 500,000 or a million being sufficient. The solder of the pans, all classes of paint, red lead of steam jointing, etc., were regarded as possible sources of contamination (*Scot. J. Agric.*, 1927, 10, p. 165). Subsequently, it is stated by Professor Leitch, the source of the trouble was found in the annatto used to colour large quantities of cheese at this period. The main supplier of this rather limited market, seeking to improve the colour of his harvest of annatto seed, spoilt by overheating, had used red lead for the purpose. Thus the minutest quantities were introduced in various parts of the world. This serves as an excellent example of the nature and difficulty of some of the subjects that are presented to the research laboratories.

Other investigations by Professor Leitch have dealt with such subjects as the use of selected lactic ferments, pasteurisation, and the manufacture and standardisation of rennet extracts.

Scientific Control.

A point that has to be kept in mind is that regularising the routine may lead to radical alterations in such matters as temperature and acidity as well as change in behaviour. For instance, in making Cheddar from pasteurised milk there is an increase in the ripening time and some loss of the true Cheddar qualities. This opens up a big field for research into the reasons for these changes and in discovering possible means of overcoming them. Pasteurisation of the milk undoubtedly goes far towards making it clean, but certain faults in flavour and texture arise (see, in this connection, Mattick and Hallett, *Jour. Ag. Sci.*, 1929, p. 452), probably because of a disturbance of the calcium-casein balance, and it becomes necessary to vary the Cheddar technique. The great aim is to produce cheese from clean milk that shall be equal to the best farmhouse cheese, but it can be readily understood that when the bacteria are reduced from, say, 1,000,000 per cubic centimetre, as in farmhouse milk, to about 100 per c.c. in clean milk, a large number of harmless but exceedingly useful organisms are destroyed. At the same time, good cheese cannot be made from bad milk, and at present inferior quality milk is being used for cheese-making. Stricter measures will have to be adopted to ensure the use of cleaner and better milk.

If all makers of one kind of cheese used the same process it would be simpler for the scientist, but they do not. Cheddar is made in Berkshire by a

method differing from that in Somerset and there is a difference in the cheese, though no one knows precisely why the technique in the two counties is not the same. There is a lifetime's study in reconciling

Butter Churning at the British Dairy Institute.

the empirical details of the farmhouse cheese technique with scientific exactitude. The cheesemaker, for instance, may say that his curd is too acid, too sweet, too wet, too dry, or too crumbly, with combinations of these; no one knows whether the scientific bases for these faults are physical, chemical, or biochemical, yet the skilled cheesemaker, working on these empirical lines, undoubtedly can turn out the finest cheese. If he did so always without fail and could teach his skill to others, there would be less necessity to know the whys and wherefores; but unhappily, all batches of cheese are not by any means first grade, and it takes years before the pupil can hope to be as good as his teacher.

The net result at the moment appears to be that the trained cheesemakers from the dairy schools are doing much good all over the country, although it is as yet too early for the full effects to be felt. No more convincing proof of the excellence of this training, and of the contention that technical skill can successfully compete with all varieties of local experience and craft and can override all factors peculiar to locality, is to be found than the display of the numerous first and second prizes won by the British Dairy Institute, under Mr. Todd.

Grading Proposals.

The necessity for a national scheme of grading and marking in order to ensure a uniformly high quality has already been stressed. Several characteristics contribute to quality in cheese; there are those like moisture and butter-fat content, which are accurately measurable, and there are others, such as flavour and texture, which do not lend themselves to precise determination. Consequently, only a broad classification is practicable under any cheese-grading system. It is satisfactory to note that a beginning has been made in the second reading of a Bill which seeks to define "cheese" as containing not less than 45 per cent. of butter-fat in the dry matters. An article containing less would come under the category of skimmed milk cheese and would have to bear a declaration showing the actual percentage of fat in it. This excellent measure met with no opposition on its first reading. In his Annual Report, H. E. Monk, the City Analyst for Salford, brings out the wide variation in samples of cheese purchased in April and May:

Sample No.	Fat (Per Cent).	Water (Per Cent).	Fat as a Percentage of the Dry Matters.	Price per Pound.
				s. d.
2441 ...	46·0	33·2	69·0	1 2
2439 ...	45·0	28·0	62·5	1 2
2425 ...	43·0	30·7	62·0	1 0
2457 ...	41·0	31·2	59·6	1 4
2417 ...	40·0	31·3	58·2	0 10
2455 ...	38·0	32·2	56·0	1 0
2454 ...	36·0	40·8	54·1	1 2
2465 ...	33·0	37·3	53·6	1 0
2440 ...	33·0	40·8	54·2	1 0
2480 ...	32·5	40·0	54·2	1 3
2438 ...	32·0	31·5	46·7	1 2
2458 ...	32·0	41·5	54·7	1 4
2419 ...	31·0	40·7	52·3	1 0
2416 ...	28·0	41·4	47·7	1 0
2482 ...	25·0	46·9	47·1	0 11
2420 ...	23·0	46·5	43·0	1 4
2436 ...	20·5	46·0	38·0	0 10
2437 ...	20·0	42·8	35·0	0 10
2418 ...	19·0	48·3	36·3	0 10
2456 ...	17·0	49·8	33·8	0 10

How Quebec Cheese is Packed so as to Reach the Consumer in Good Condition.

(By courtesy of the Quebec Ministry of Agriculture.)

It is interesting to see that while one may pay 1s. 4d. per pound for a cheese containing but 23 per

cent. of fat (No. 2420), it is yet possible to purchase one with 40 per cent. at a price of 10d. per pound (No. 2417). The second cheese is thus about treble the value for money of the first. Under present conditions all the above cheeses must be classed as "genuine." If the proposed Bill became law those cheeses below the line in the Table would fall below the standard, and would have to have the percentage of fat declared.

The question of grading, however, in which the Ministry of Agriculture has interested itself, is being made the subject of a separate measure. The matter is a complicated one, as definitions of quality are elusive and difficult; for instance, a cheese may prove on analysis to contain 45 per cent. or more of butter-fat and yet be very poor in flavour or texture. On the other hand, a cheese prepared with a low butter-fat content is more or less bound to have its quality impaired.

There are several ways in which the grading of home-produced cheese could have been carried out. The Ministry of Agriculture, for instance, could have appointed and trained a large number of travelling graders who would have visited each small producer having a batch of cheese ready for the market. The objections against this were (1) the large number of graders required, which would add tremendously to costs; and (2) the fact that, as cheese takes frequently six weeks or more in its course from producer to consumer, a batch which had been graded as first class shortly after production might easily develop later defects which would bring it below grade and tend to discredit the scheme.

The factors might have been allowed to grade their cheese themselves. This was, in fact, suggested, but was considered inadvisable by the factors themselves on the grounds that the grading would vary so widely, according to the ideas of the individual grader, that the standards would be so in name only.

The plan which seems most promising to date, and which is now being discussed, is for a comparatively small number of cheesemakers of known good repute to be appointed under an official scheme and permitted to market their cheese under a special mark. In the first instance, the appointment would be for a probationary period of three months, during which the output would be kept under fairly constant supervision. At the end of that time, if satisfactory, the appointment would be confirmed and the maker would continue to grade and mark his own cheese. Periodical checks would be made by the authorities to ensure that the required standards were being maintained, repeated lapses from which would entail removal from the list and loss of right to the distinguishing mark applied to such graded cheese. As the scheme got under way the number of selected manufacturers could be increased. This scheme, of all suggested, seems to be the most satisfactory; it would not entail too large a staff of inspectors or graders, any lapse in quality would probably be local and detected before it had any opportunity of damaging the reputation of graded cheese in general, and it would add least to production costs.

The National Institute for Research in Dairying at Shinfield, Reading.

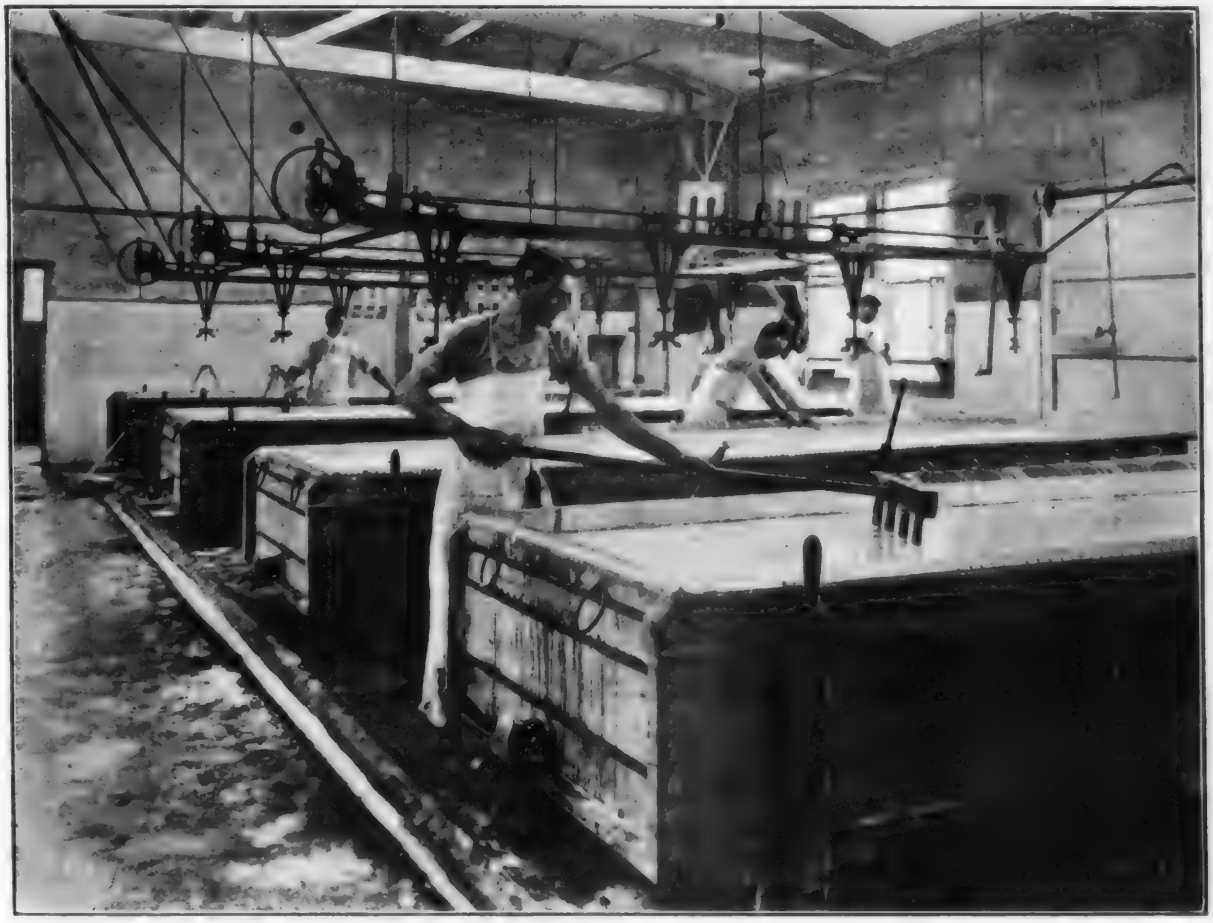
Canadian Grading Methods.

Agricultural producers in Canada early came to the conclusion that before they could hope to obtain a satisfactory market for their produce some system of grading for quality was indispensable. Before

this could be done, however, it was necessary that the cheese or butter produced should be of a uniformly high standard and worth the trouble of grading and, accordingly, arrangements were made by the provincial Governments for the provision of expert instruction in dairying technology. In the case of Quebec, which is one of the leading provinces as far as production values are concerned, there is maintained a well-organised service of instruction for those operating cheese or butter factories (all Canadian cheese is factory made) and diplomas are awarded on qualification. A chief operator at such a factory is required by the Government to possess either a butter or cheese maker's diploma, if not both, and a licence as an expert milk tester. These licences are revocable if the required quality is not maintained.

By an Act passed as long ago as 1923, all cheese and butter intended for export must be graded by a Government official. Every cheese and every package containing cheese or butter has to be marked at the factory with the vat or churning number, these running consecutively throughout the year. The grader selects one cheese from each vat, or one package of butter from every churning, from each shipment and grades the whole selection as a result of tests on the sample. The graders have to observe certain standards and definitions in carrying out their work. In the case of cheese, points are allotted as follows: Flavour, 45; texture, 25; closeness, 15; colour, 10; finish, 5; total, 100 points. To qualify as special grade a cheese must score 94 points or more, including not less than 41 for flavour, and be firm, smooth, and meaty in texture, having no ragged holes, be of good uniform colour, even in size, with a sound surface and smooth finish. It must also conform closely to a certain size in order to fit the special wooden cases in which it is exported.

"First Grade" cheese must score between 92 and 94 points, with not less than 39 for flavour, and "Second Grade or Fine Cheese," 87 to 92 points, with not less than 37 out of 50 points for flavour. These standards apply to all cheese originating in Canada and intended for export; they have become known to and accepted by the purchasers, and, though such very close supervision might seem irksome and hampering, this criticism is countered by the fact that Quebec alone in 1929 produced 35,156,871 lbs. of cheese for export.



Cutting the Curd in a New Zealand Factory.

(By courtesy of the High Commissioner.)

Emulsification in Food Manufacture

By J. O. SIBREE, B.Sc., A.M.I.E.E., A.INST.P.

In this article the basic principles of the subject are discussed. The second part will deal with machinery used for effecting emulsification and homogenisation.

PART I

IN A famous play one of the characters discovers with surprise that he has been talking "prose" all his life without knowing it. Similarly, the average person might be astonished to find he has been drinking emulsions all his life without knowing it; and it is a fact worthy of note that the food on which all human beings and other important members of the animal kingdom start their life is an emulsion.

While natural milk is an emulsion which bears comparison with those artificially made, its fat-globules are far from being as finely divided as those obtained by the aid of modern machinery, and it has long been known that if natural milk is passed through an homogeniser the further sub-division of the fat-globules not only increases the apparent richness of the milk, but actually increases its digestibility and food value.

This broad hint given to us by nature might well be followed with advantage to our health in general, and digestion in particular, during later periods of our life. Put briefly, the butter fat which is digested with difficulty when swallowed as a lump can be digested with ease in natural milk, and with greater ease in homogenised milk, and this is easily understandable when one pictures the minuteness of the millions of individual fat-globules, each of which becomes surrounded by the digestive juices. Another example which will occur at once is that of cod liver oil, which is really a valuable food, though generally referred to as a medicine or tonic. It is well known that the majority of people cannot assimilate the oil "neat," but can do so when it is emulsified. Indeed, it is probably safe to say that all fats are emulsified in the stomach before they can be digested.

The foregoing observations, which could be multiplied considerably, definitely lead us to the conclusion that emulsification ought to be considered in connection with all oils and fats used for human consumption.

Until recent years, almost the only emulsion artificially made as a food was mayonnaise or salad cream, whereas the number of emulsions now used is large and is increasing. In addition to infant foods, we find the importance of emulsified fats becoming more and more recognised in the bread-making industry. A large proportion of modern ice-cream is made from re-emulsified pure fresh butter, and this is the source of cream on an ocean liner. Essential oils are emulsified for flavouring sausages, sauces, beverages, and enriching cakes, and so on.

What Constitutes an Emulsion?

If we take two liquids which do not mix with each other, or are practically insoluble one in the other, and shake them together in a test-tube, it is found that one liquid is broken up into drops distributed throughout the other. These drops, however, quickly coalesce, and the liquids separate completely one from the other and form two distinct layers. If the two liquids are, say, a pure oil and distilled water, and the agitation has been very vigorous—*e.g.*, by boiling under a reflux condenser—it is found that a very small portion of the oil remains dispersed throughout the water in the form of very minute globules or drops. This is known as an emulsion of oil in water. The oil is known as the discontinuous or dispersed phase, and the water as the continuous phase or the dispersion medium. While emulsions

A Typical Emulsion.

(From Clayton's "Theory of Emulsions and their Technical Treatment." 1928. Churchill.)

of which water is one phase have been the subject of extensive research, it should be noted that emulsions can be prepared which do not contain water, and we also have emulsions in which water is the dispersed phase and oil the continuous phase.

Broadly speaking, emulsions may be divided into two distinct classes: (*a*) Simple dilute emulsions of oil in water, dilute in the sense that it is seldom possible to obtain more than 1 part of oil in 1,000 parts of water. (*b*) More complicated and concentrated emulsions of oil and water, concentrated in the sense that they may be obtained containing up to 99 parts of oil in 1 part of water. Emul-

sions of this class always contain a third substance, which is known as the emulsifying or stabilising agent. The first class of dilute emulsions has little or no technical importance except where they occur as a nuisance in various processes—*e.g.*, in the condensed water of a reciprocating steam-engine. Their main importance is theoretical in that they resemble the suspensoid colloids, and extensive researches have been carried out on them. It is with the second class that we are concerned in the manufacture of food.

Raw Milk and—

—Homogenised Milk.

(By permission of United Dairies, Ltd.)

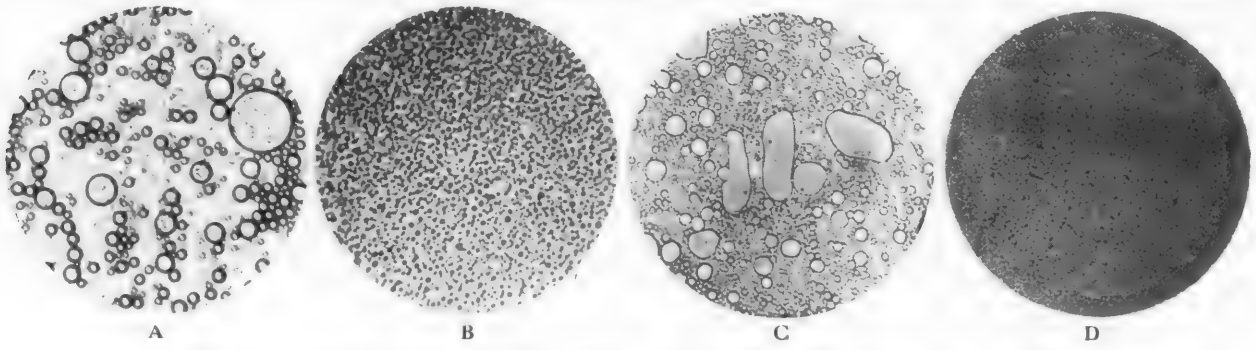
Brief Theory of Emulsification.

Although a number of theories of emulsification has been put forward, it may be said at once that, as yet, no one theory completely covers the very many perplexing facts which crop up when emulsification is studied. To return to our two immiscible liquids, one of which we will suppose is water and the other a liquid paraffin, suppose that to the water has been added about 1 per cent. by weight of sodium oleate. On shaking the mixture, the oil breaks up as before, but now a white emulsion is formed, and, on standing, this rises to the top as a white cream. If a sample of this cream is taken it will be found to contain from 70 per cent. to 80 per cent. of oil, and if a drop of it be examined under the microscope it will be found to consist of drops of oil of various sizes separated by a film of water. It is known that sodium oleate reduces the surface tension of water, and this lowering of the surface tension generally goes hand-in-hand with a lower interfacial tension against another liquid, and thus accounts for the fact that the films between the drops do not tear. In addition to the lowering of the interfacial tension, there is evidence, both theoretical and practical, which shows that the emulsifying agent, in this case sodium oleate, is adsorbed at the interface of the water and oil, and thus we get a film surrounding the drops which has a very special structure. The special structure of this film is the foundation of one of the best-known theories of emulsification, a theorem known as the "oriented wedge or truncated cone theory." According to this theory the molecules of the emulsifying agent are supposed to be oriented in the film in a particular way, and this is represented in the sketch, where the circles stand for sodium atoms and the straight bands represent the fatty acid radicals. When emulsification takes place the hydrocarbon chains point towards the oil and the sodium atoms towards the water. It is assumed that the sodium atom is broader than the hydrocarbon chain, and hence, in order to get the closest molecular packing of the emulsifying agent, a drop of oil must be formed with water as the continuous phase. If, on the other hand, we take a divalent metal, and dissolve, say, magnesium oleate in the oil and shake it with water, we get an emulsion of water-in-oil, as illustrated in the sketch. The two hydrocarbon chains are now broader than the magnesium atom and are turned towards the oil, thus forming drops of water with oil as the continuous phase. There are various objections to this theory, which does not cover the fact that solids, such as the basic sulphates of heavy metals, are excellent emulsifiers and promote emulsions of oil in water, while lamp-black produces emulsions of water in oil. It also fails to account for the fact that multiple emulsions are possible—that is, emulsions in which drops of the disperse phase contain within them drops of the continuous phase—and

A Quinque-Multiple Emulsion.

(From Clayton's "Theory of Emulsions and their Technical Treatment." 1928. Churchill.)

there are several other puzzling phenomena which are still unexplained. As a general rule the emulsifying agent must be soluble in the continuous phase, and, in the case of solid emulsifiers, the liquid which most easily wets the emulsifying agent remains



Photomicrographs showing Emulsions of Mineral Oil (A and B) and Salad Cream (C and D) before and after Homogenisation.

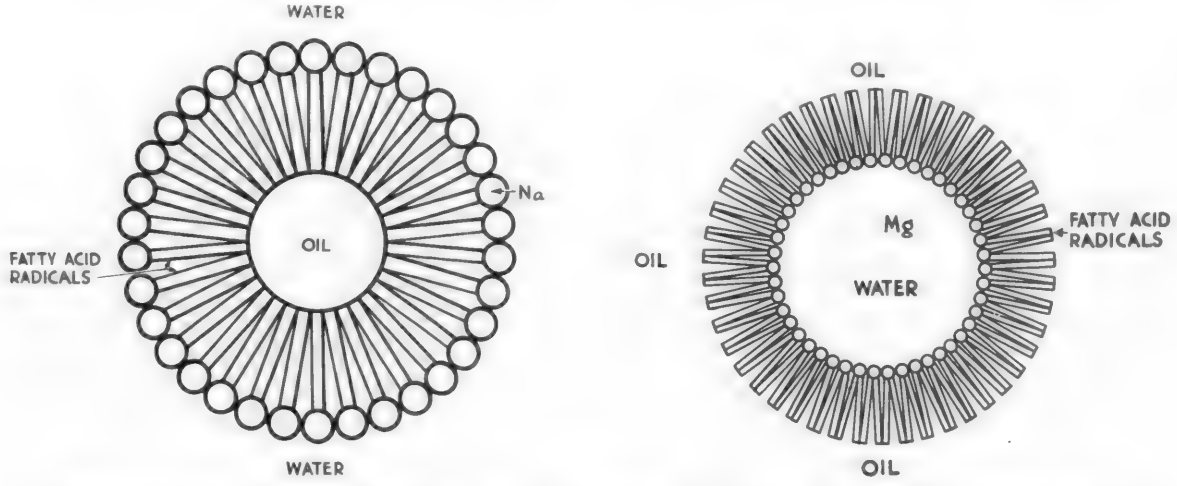
A.—An emulsion of mineral oil in water, containing 10 per cent. oil and produced by a centrifugal emulsifying machine. The largest globule is about 18 μ and the others vary from 2 μ to 8 μ. It has a yellow colour and is homogeneous to the eye.
B.—Same emulsion after passing through homogeniser at 2 tons sq. in. Most globules are 0·1 to 0·2 μ and the colour is white.
C.—A salad cream before homogenisation. The oil globules are up to 20 μ. It appears homogeneous in bulk.
D.—The same cream homogenised. All globules are less than 1 μ and most 0·1 to 0·2 μ. The colour is lighter and the viscosity much greater.

(By permission of Alfa-Laval Co., Ltd.)

the continuous phase, but there are exceptions to both these rules.

Size and Size Distribution of the Drops.

The size of the drops is an important factor in most emulsions, and its determination is a very valuable routine check in any process in which emulsions are manufactured. The unit generally adopted for the measurement of the diameter of the drops is the micron, which is one-thousandth of a millimetre, and is indicated by the symbol μ—*i.e.*, one micron = ·001 mm. = ·00039 inch = 1 μ. Many commercial mills prepare emulsions in which the size of a large number of the particles is of the order 2 μ and even smaller than this. It should be noted that, generally speaking, the more viscous the oil the larger the particles, so that if two emulsions are prepared under exactly the same conditions, but in one we have a limpid oil and the other a viscous oil, then the latter has the larger particles. It is of advantage for a commercial emulsion to have particles as small as possible, since, apart from an improvement of food value, the smaller the particles the more slowly does the emulsion cream or separate into two distinct layers. It is practically impossible to arrange that the disperse and continuous phases have the same density except at one particular temperature, since the coefficients of expansion of the oil and water are different. Hence, at any other temperature the oil either rises or falls. To take milk as an example of a very dilute emulsion containing on an average 3·5 per cent. butter fat, and with particles varying from 10 μ down to 1·5 μ, we all know that this creams very readily. But on being homogenised the particles are reduced to 0·1 μ and under, and little or no creaming takes place; indeed, a properly homogenised milk cannot be separated even when centrifuged. If the same process of homogenisation be applied to mayonnaise, in which the concentration of



Diagrams illustrating the Oriented Wedge Theory of Emulsions. Left: Sodium Oleate. Right: Magnesium Oleate.

oil is much greater and the viscosity of the continuous phase is also greater, then we get an emulsion which can be kept for very long periods without showing signs of separating into two layers.

A general idea as to the size of the particles can easily be obtained by taking a drop of emulsion and placing it between a microscope slide and cover-glass, and examining it in the usual way. A $\frac{1}{6}$-in. objective and an eye-piece of X6 to X10 will show the details of emulsions generally manufactured. If, however, it is desired to make a statistical count of the particles, then it is necessary to take a micro-photograph of the slide, and this can be easily and quickly done in the following way:

The slide is kept in position and the microscope is turned so as to be horizontal. The slide is illuminated with an arc lamp or, if one is not available, a 25-watt motor headlight bulb will give good results. If the lamp is brought near to the Abbé condenser an excellent image of the slide can be projected on a screen. By using a suitable draw-tube length and screen distance, magnifications can easily be obtained from 500 to 1,500, and photographs can then be obtained directly on bromide paper or on photographic plates.

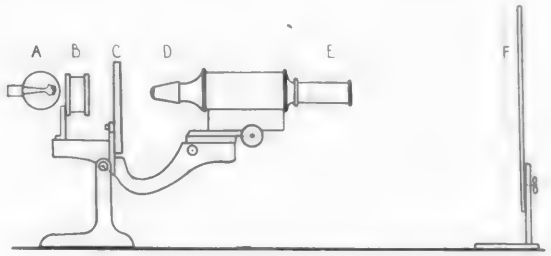


Diagram showing Arrangement of Microscope for making a Count of Emulsion Globules by Photo-micrography.

A, lamp; B, Abbé condenser; C, stage; D, objective; E, eye-piece; F, screen.

In addition to effecting emulsification and intimate mixing of materials, many mills have actually a sterilising effect. Most bacilli are from 3 μ to 6 μ in length; now many mills reduce the bulk of the material to a size of 1 μ and under, and hence any organisms present are broken up and destroyed.

Recent Practical Applications of Dry Ice

DRY ice (solidified CO_2) has now entered well upon the practical stage of its existence, and it is finding many applications in the transport of perishable foodstuffs. The preservation of ice-cream during transport was one of the most obvious applications for the new refrigerant; it enables, on a smaller scale than was possible before, ice-cream bricks and cups to be enclosed in cartons or wrapped in paper and packed into a larger carton together with one or two small pieces of dry ice, properly disposed, and the package sent off to the consumer. The additional weight to be carried is very much reduced, and the package is usually of the non-returnable type. The practice described above is very common in European countries, especially Switzerland, where a great deal of investigation has been carried out. The points to remember are that the very cold solid, at – 110° F., should not be in direct contact with the ice-cream; and the joints of the outer carton should be sealed with adhesive paper tape, to make the package as air-tight as possible and retain the cold gases. Although, bulk for bulk, the heat capacity of dry ice is only four times that of an ice and salt mixture, the ease with which the "cold" may be applied makes it practically much more efficient than is indicated by these figures.

The application of dry ice to bulk transport of frozen or chilled goods is usually a matter to be discussed in individual cases from general rules rather than one about which hard and fast laws can be laid down. Very satisfactory boxes and van bodies have been constructed which will hold a given temperature within two or three degrees either way. It is usually advisable to have the insulating walls as thick as possible—four to six inches is a usual figure; the doors should be as air-tight as possible, and the dry ice, in some sort of container, should be placed in the roof of the van or in the top of the box.

For refrigerating work on a fairly small scale—and this covers nearly all shops and restaurants and all private houses—there is everything to recommend dry ice. The more elaborate containers used for this kind of work usually have an inverted vacuum flask to contain the block of dry ice which is used for cooling purposes: this is the practice of the Carba companies in many parts of the world, and we illustrate a household cabinet of this kind. The vacuum container, the metal cover of which can be seen on the top of the refrigerator illustrated, forms a nearly perfect heat shield for the block of dry ice. The lower part of the block projects into the interior of the cabinet, and the temperature is controlled by exposing more or less of the block. In this kind of container a twenty-pound block of dry ice will last a week and hold a temperature within two degrees of that regulated for at the beginning, until all the ice has gone. The higher range of temperature, a little above freezing-point, is useful for dairy produce and meat and fish, and a modification of this type of cabinet is used for the lower range of temperature at which ice-cream is stored. In normally ventilated rooms, the volume of CO_2 evolved is not sufficient to be apparent.

A more recent application of dry ice has been in the actual manufacture of ice-cream. The cylindrical or square block of dry ice supplied by the manufacturer is ground in a small grinding attachment to the usual type of food mixing

(*Continued on page* 180.)

Scientific Control in Ice-Cream Manufacture

By ERIC L. E. HUMPHRISS, F.R.M.S.

The writer gives a concise account of the methods which, in the present state of our knowledge, he has found to be best adapted to the scientific control of the materials and manufacturing processes used in the ice-cream industry.

LABORATORY CONTROL of ice-cream manufacture, in common with that of most modern foods, consists largely of analytical chemistry and bacteriology applied both to the ingredients and to the finished product. In addition, in dealing with a commodity such as ice-cream, the final palatability of which depends to a large extent on the physical state of one or more of its constituents, the scientific supervision of the technical processes through which the product passes is essential to the production of a uniform product.

Chemical Control.

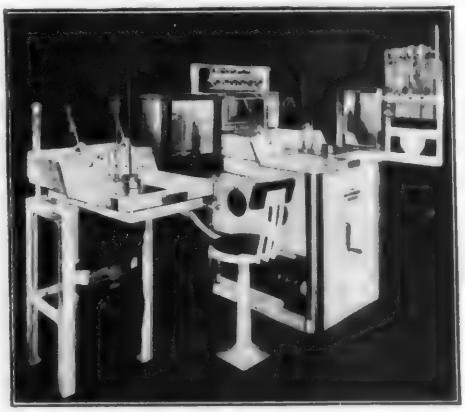
The object of the application of chemical control to ice-cream manufacture is to ensure at all times a product of unvarying composition. The ideal would be the analysis of each ingredient prior to use and the computation, based on the analytical data so secured, of a mix formula by methods outlined in FOOD MANUFACTURE, November, 1930, p. 322, which would give an ice-cream of exactly the required percentage composition. In some cases, as, for instance, when the mix is compounded from fresh butter, skim milk powder, and water, this course is adopted, but more often than not such a procedure is impossible.

Where perishable dairy products such as milk, skim milk, condensed skim milk, and fresh cream are utilised as mix ingredients, they are usually not available until required for use, when the following line of control is operated: All such dairy constituents of the mix must be sampled and their odour, appearance, and titratable acidity determined before they are incorporated in the mix. The acidities are estimated by titration of 10 grms. of the ingredient with N/10 NaOH against phenolphthalein and expressed as grms. per cent. of $CH_3.CHOH.COOH$. Milk and skim milk should not exceed 0·180 per cent., condensed skim (3 to 1) 0·450 per cent., nor fresh 50 per cent., cream 0·126 per cent., as acidities sensibly in excess of these figures indicate considerable bacterial decomposition of the lactose present, and may result in coagulation of the mix (casein) during pasteurisation. If necessity compels the use of such "partially soured" ingredients, the excess of acid over and above the amounts mentioned must be neutralised with the stoichiometrically calculated amount of $NaHCO_3$. The bicarbonate should be added to the mixed ingredients before heating up is commenced, the gradual increase in temperature and agitation effectually driving off the CO_2 evolved during the neutralisation. While the mix is being processed, total solids and butter-fat estimations are run on the ingredients. Any serious departure of the mix from the predetermined percentage composition is thus anticipated, and, if necessary, a small "balancing mix" can be computed and "put over" at the end of the day and a final check analysis of the mix made, which should now closely approximate to theoretical. The routine check analysis of the mix consists of butter-fat, total solids and (by difference) non-fatty solids, and titratable acidity determinations, while it is also advisable to run complete analyses from time to time as an additional safeguard. Periodical examinations must be made of the sugar used, and moisture, SO_2 and gel strength determinations run on each consignment of gelatin. In order that the correct amount of gelatin be added at all times to the mix, gel concentration tests should be performed at frequent intervals on the mix itself, when the quantity of gelatin-yielding optimum results as regards texture can be estimated to within 0·05 per cent., which incidentally is the degree of latitude permissible in the mix gelatin content without causing a sensible alteration in the texture of the hardened ice-cream.

In addition to the foregoing, analytical control can with advantage be extended to such adjuncts as flavours, colours, fruits, etc., used in both ordinary and special ice-cream, while regular check of such factors as brine concentration and reaction (acid brine is very corrosive) and occasional analysis of the water supply are all within the province of the ice-cream plant chemist.

Bacteriological Control.

Of equal importance to the chemical control of ice-cream manufacture is the regular and systematic

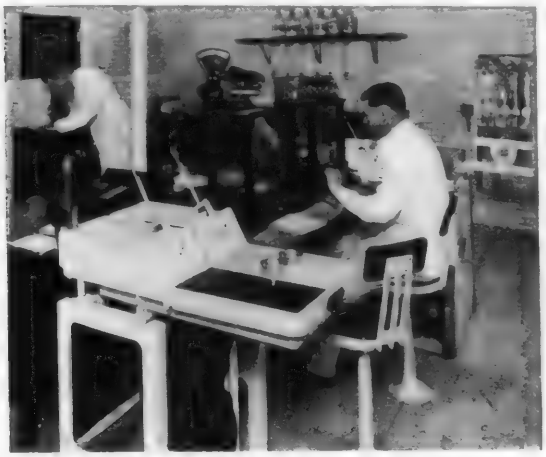


Apparatus Used for Rapid Determination of Butter-Fat and Total Solids Contents of Ice-Cream.

(By courtesy of Wm. Storer, Ltd.)

bacteriological examination of ingredients, product, and plant. Analytical bacteriology suffers the dis-

advantage of being very much less accurate and taking considerably longer than chemical analysis, and it is for these very reasons that regular work is essential if reliable data and useful inferences are to be available. The plate count of total organisms and bile salt, lactose, litmus, peptone water presumptive coli test require three days' incubation. The direct microscopic count (Breed's) is inapplicable to pasteurised dairy products, owing to its not differentiating between living and dead bacteria. The scheme adopted by the writer, which has given satisfactory results and illustrates the general prin-



A Test being carried out at an Ice-Cream Factory.

(By courtesy of Wm. Storer, Ltd.)

ciples on which any system of bacteriological control of ice-cream production should be based, is as follows: Each week one (in the busiest season two) mix is subjected to a complete bacteriological examination. That is, a sample representative of the whole bulk of each ingredient used is taken and examined as to total organisms and coli group content, similar enumerations being performed on the processed mix. This gives at one and the same time a check on each ingredient used, an indication of the efficiency of the pasteurising process and of the hygienic state of the plant itself. In addition, at regular intervals counts are performed on the first mix to issue from each machine, from the viscoliser to the packaging machines, the results correctly interpreted (having regard to such effects as bacterial clump disintegration by the viscoliser and so on) indicating the efficiency of the cleansing and sterilising methods practised in the plant. Frequent examinations are carried out on the finished ice-cream (that is, over and above the weekly or bi-weekly tests mentioned above) and any unfavourable indications at once followed up. Also, as was mentioned under "Chemical Control," colours and flavours, fruit pulps, and the like should be submitted to bacteriological scrutiny at frequent intervals, as colour solutions especially may be heavily contaminated with bacteria. Occasional examinations of the water supply and also of the air in the factory should also be included; the latter is really an ingredient, being incorporated in the form of microscopic spherical cells sometimes to the extent of 100 per cent. as over-run.

Discussion of the technique used in the laboratory control of ice-cream production is out of place here, though it is permissible perhaps to mention that in bacteriological work it is imperative, in order that results may be comparable, that standardised laboratory methods be adopted; the official method for milk may, with practically no alteration, be used for ice-cream mix.

Other Control Measures.

The third application of science to the control of ice-cream manufacture may now be briefly considered, and this phase of supervision is of no less importance than the two already noticed, and is, in fact, inter-related and complementary to both.

In the first place, regular checks, and, if necessary, adjustments, of all thermographs and recording thermometers should be carried out; a convenient interval between each check is a fortnight. Similarly, brine and hardening-room thermometers should likewise be tested against a good standard thermometer at least once a month. The temperature of the mix coming from the cooler should be frequently taken and the operative informed of any necessary readjustments necessary to water and brine (or NH_3) flow. The efficiency of the viscoliser must be ascertained preferably on every mix, and this is easily accomplished by microscopic examination of a droplet of mix at the time it is being analysed. In order to maintain a uniformly smooth textured product, accurate control of the freezing process is essential, and there exist various instruments, actuated either thermally or electrically (by insertion in the motor circuit), which indicate when the mix is ready for drawing. Whether such aids to the operator are fitted or not, the time required to freeze and whip each batch should be recorded by

Ice-Cream Overrun and Weight Tester.

(By courtesy of Wm. Storer, Ltd.)

Gives a direct reading of both weight per gallon and per cent. of overrun by volume and weight.

the freezer operator, as well as the percentage over-run he obtains, as determined in one of the specially constructed machines. The chemist should check the accuracy of the over-run tester at intervals and also the temperature at which the mix is drawn from the freezer, and should scrutinise each day's freezing

report. The condition of the scraper blades and speed of the dasher must also be occasionally checked. The temperature of the semi-frozen ice-cream in the chutes and in the hopper of the packaging machines should also be taken in order to ensure that no rise in temperature compared with that at which the cream is drawn takes place—a circumstance very damaging to texture. Organoleptic tests should be daily conducted to ensure that, in spite of all precautions, no fluctuation in the texture and body of the finished, hardened ice-cream occurs.

As implied at the outset, the final palatability of ice-cream depends to a large extent on the physical state of one ingredient—to be precise, the magnitude of the ice crystal—and this in turn is largely determined by the treatment the mix receives subsequent to its entry into the freezer. This being so, too much attention cannot be given by the chemist to ensure that this ice crystal magnitude shall be of minimum value. Unfortunately, no precise scientific method is at present available whereby this entity can be accurately appraised; hence the daily "sampling" test advocated above.

Attention should also be given to the methods used in cleansing and sterilising the plant and ice-cream cans, and the composition, characteristics, and possible corrosive action of any new cleansing or disinfecting agent fully investigated before it is permitted to be used in the factory.

Finally, one may add that the foregoing does not purport to be a detailed or final description of the application of scientific control to the manufacture of ice-cream. Rather, the writer has indicated what he has found to be the most advantageous way, in the present state of our knowledge and the industry, of applying the principles of science to the control of production in a sphere where no indigenous precedents exist.

Soda Fountain Luncheonette Catering

By A. E. SIDDALL

THE SODA fountain business has by no means sprung up like a mushroom in the night as many people think. The origin of the soda-water fountain was the operation of drawing natural mineral spring water from a tap. In later years it was found that the addition of fresh fruit juices to the water made a far more palatable and refreshing drink. During this period improvements were being made in refrigeration, and in the year 1833 the first soda fountain was built in the United States, simply consisting of a cabinet in which were fitted receptacles containing fruit juices. The water used for diluting the juices was fresh water saturated with carbonic acid gas, and it was not very long before similar fountains were introduced into this country.

Very many years before the introduction of the soda fountain, ice-cream had been sold as an appetising summer confection, and it was not long before it was found that by blending the fruit drinks from the fountain with ice-cream a delicious refreshment resulted. This co-operation was the medium for the introduction of the "front service soda fountain," and the definition of a soda fountain as the equipment is known to-day is "an equipment from which chilled beverages and iced confections are dispensed."

The iced confections did not merely consist of the fruit juices and the ice-cream, which are technically known in the business as ice-cream sodas, and frappés, but it was found that by serving fresh fruit with the ice-cream it was much appreciated by the public. This form of confection was given the name of "sundae," and to-day there are many other dishes that come under the category of sundaes.

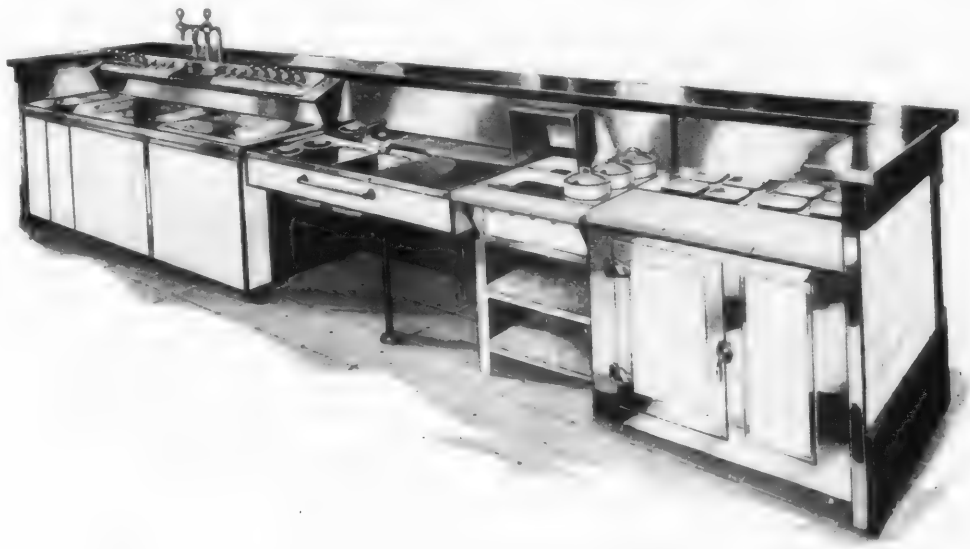
The various dishes that are served on a fountain that contains ice-cream are ever increasing. As a matter of interest, it is worth stating how the word "sundae" was introduced. Very many years ago there was a law in the United States forbidding the sale of ice-cream on Sunday. One ice-cream vendor realised that the law did not forbid him selling ice-cream if it was served with fresh fruit, and, therefore, he introduced the dish which he christened a "sundae." This form of confection rapidly grew in popularity, and to-day they have the largest sales in the business. A sundae is a combination of an ice-cream and fruit, and by blending various flavours of ice-cream with different fruits a great variety of dishes can be made that are not only pleasing to the palate but attractive to the eye. With this object sundaes are served up in different shapes and styles of dishes, the different dishes carrying with them their own particular name—*e.g.*, specials, parfaits, royals, melbas, etc. In a similar manner, in blending ice-cream with the fruit syrups we get ice-cream sodas, ice-cream sodas with fruit, frappés, ice-cream shakes, etc. A fully qualified dispenser can continually increase the range of variety.

In consideration of the high standard of food value in all items served from a soda fountain, it is imperative that the equipment from which the products are dispensed must be such that it keeps the different forms of food in the very best of condition. As all fruit juices contain a certain amount of acid, it is essential that the containers holding these juices must be made from the very best glazed porcelain, or glass. The greatest difficulty is in finding a suitable method of ejecting the juices into the serving vessels. In the old type of fountain an ebonite rod with a rubber tip was placed in the jar, which had an outlet on the bottom in which fitted the rubber tip. Upon pressing the lever the rod was raised clear of the hole, which allowed the syrup to run out. This method was very successful to a point, but the draw-

back was that it was difficult to guess the correct amount of syrup for each drink. The next improvement was the introduction of a self-measuring pump that ejected the same amount each time.

Owing to the pressure required in pressing down the pump head the ebonite rod was no longer practical, and metal had to be used, and, due to the acid in the fruit, a metal had to be found which would be proof against corrosion.

Up to recent times the only reliable metal was block tin, but it has now been found that monel metal is very satisfactory. The same care has had to be paid to finding a reliable metal for use in the machine in which the carbonated water is manufactured, and also for the leads from the machine up to the draught arms from which the carbonated water is drawn. The metal used here is pure block tin.



It is well understood that different foods require different temperatures in order to keep them in saleable condition, and on a fountain that is built to be able to serve every dish that appears on a complete menu there are no fewer than four different temperatures required.

In going through the various compartments that are contained in the service part of the fountain, we have:

1. Brick or package compartment, which is maintained at 5° F.
2. Bulk ice-cream compartment, 10 to 15° F.
3. Dry storage compartment in which fruits, cream, milk, or any perishable foodstuffs can be stored, 40° F.
4. Carbonated and fresh water cooling compartment, 33° F.

Up to quite recently manufacturers paid no attention to the cooling of the fruits and syrups that were held in the pump rack, and the public complained that the beverages, particularly, were being dispensed while lukewarm. These complaints led the manufacturers not only to cool the pump rack by means of insulation, but to use a mechanical device which maintains the whole of the pump rack at 40° F.

The same care and attention in the manufacture of equipment has been paid to the luncheonette as in the soda fountain. The equipment necessary for the former are a steam table, a sandwich preparation table that is automatically refrigerated, an urn stand and cutting benches, electric toasters, waffle and griddle irons. All these are finished in the same metal as the soda fountain, so that when assembled they have the appearance of one complete unit. The counter is a separate piece of equipment, which is placed round the component parts. It is made from material to harmonise with architectural features and to blend in with any colour scheme that may be carried out in the premises. The counter by its artistic design is its own salesman, and the counter top is designed to enable rapid service. Another reason why the soda fountain and luncheonette service have become so popular is because the public can see for themselves how the various foods are conserved and the care and attention that the dispensers take in preparing the dishes.

The purity of the food products, and the clean and hygienic methods of dispensing, have gained so much public favour that the field of the soda fountain business has grown into a very important branch of the catering world, by the addition of a luncheonette department. Whereas the majority of fountains only did their peak business during hot weather the combination has made it possible to have a regular trade throughout the complete twelve months. On a luncheonette menu the customer can obtain soups, a large variety of sandwiches, either cold or toasted, salads, and salad dressings, fruit salads, griddle cakes and waffles, pastries, hot beverages, such as tea, coffee, cocoa, malted milk, Bovril, etc. It is possible to serve a complete light lunch or supper that will satisfy the most sensitive palate.

Enquiries

Enquiries are dealt with immediately on receipt, and the desired information is communicated in full by private letter. The replies given below are merely brief abstracts or indications that the names and addresses, or whatever may have been requested, have been supplied. Any further information supplied to us relating to the questions appearing below will be passed on to the enquirers.

242. *We are interested in the manufacture of ice-cream. Kindly quote addresses of manufacturers of machinery for same.* (London.)

Recommendations made.

243. *London address of The Pomosin Products, Ltd., required.* (Glasgow.)

Supplied.

244. *Is there any literature relating to peanut culture and the peanut industry?* (London.)

An article appeared in the *Journal of Agriculture for Western Australia*, 1931, volume 7, page 498. We would advise communication with the Imperial Institute and with Mr. A. R. Harwood; we are under the impression that the latter has written a book on nuts.

245. *We have recently placed on the market a new custard powder and desire to get in touch with buying agents.* (Sheffield.)

246. *We are anxious to get in touch with a firm dealing first-hand in finest York hams. Could you suggest any such firms?* (Reading.)

Suggestions made.

247. *Would you advise me as to the meaning of "A.O.A.C." and where this publication can be obtained?* (Reading.)

This stands for the "The Journal of the Association of Official Agricultural Chemists." Apparently this is issued by the U.S. Department of Agriculture, Bureau of Chemistry, Washington, D.C. We have written to the Department for full particulars.

248. *Kindly inform us if you know of any method that could be used for cleaning new potatoes for canning. We cannot use the ordinary potato cleaner, as the skin must not be broken. We have tried steaming at various degrees and for various times, but our experience has been that when an attempt is made to remove the outer skin, the surface is too soft and all skins are removed, which is the one thing we particularly wish to avoid.* (Jersey.)

A firm of engineers recommended, who should be able to tackle the problem successfully.

249. *Should be glad if you could recommend a firm willing to make up experimental batches of ice-cream.* (London.)

This was done.

250. *We should be glad to know the name and address of a firm manufacturing potato-slicing machines as used in fish and chip establishments.* (Dublin.)

Names of two firms supplied.

251. *Information required on banana flour and where it can be obtained.* (London.)

Put enquirer in touch with a competent authority.

252. *Names of manufacturers or suppliers of malt extracts required.* (London.)

Names supplied.

253. *Address required of any firm making hand potato-chip machines.* (Westcliff.)

Supplied.

254. *Could you possibly put me in touch with a firm who supplies "D"-shaped moulds for glazed meats?* (Shropshire.)

Names of firms and their addresses given.

255. *Required name of makers of "Viota" cake mixture.* (London.)

Messrs. Stoddart and Hansford, London, N. 1.

256. *Required names of firms supplying artificial sausage skins.* (London.)

These were supplied.

257. *An enquirer wished to be put in touch with makers of butter blending and moulding machines.* (London.)

Names and addresses of three firms given.

258. *Who is the maker of "Gelozone," and is this suitable for use in the manufacture of meat jelly?* (Ireland.)

Gelozone is made by Whiffen and Sons, Ltd., London, S.W. 6. It is prepared from Carragheen, and is primarily intended to use as a substitute for gelatine in ice-cream, possessing the advantage that no harm is done even on prolonged boiling. Also the time required for the emulsified mix to mature is considerably reduced. It is claimed that Gelozone may be used in place of gelatine for all purposes. It would appear to be suitable for meat jellies, except that it will not make a clear jelly. It can be used for such products as thick sauces, soup, and emulsions generally, and is stated to be more economical and efficacious than gelatine or gum tragacanth.

259. *We would be much obliged if you would put us in touch with manufacturers supplying labelling machines for round cans.* (Newcastle-on-Tyne.)

Several suitable firms recommended.

260. *Can you give me the name of a manufacturer of a suitable machine for turning out sugar pills (samples submitted and some particulars of the process given)?* (London.)

It is doubtful if there is any standard machine made for this work, but we suggested several firms who would no doubt be prepared to get out a design for one, as the operations involved are quite simple and similar machines are used in making boiled sugar goods.

261. *Advice wanted on the question of vinegar, spices, and the flavouring of mayonnaise.* (Edinburgh.)

Perhaps the following notes from an American source will be of assistance:

Vinegar may be clear, cider, malt, or distilled, of not less than 4 per cent. acetic (40 grains) or more than 5 per cent. (50 grains). A total absence of "mother" is preferable in all vinegars, as it produces a finished product of less active rancidifying properties. The preference for any of the above vinegars is entirely a matter of individual taste over price. Cider vinegar imparts a faint aromatic flavour quite delicious in mayonnaise. The same is true of malt vinegar, which has a characteristic malt aroma in addition to the acetic acid. To ensure quality, vinegar should be purchased in new barrels and stored in a cool room. The feature of a new barrel is one of insurance—*i.e.*, contamination from other substances formerly in the barrel, as it is quite difficult to clean thoroughly a used barrel.

As regards spices. The mustard used in mayonnaise is a product known as mustard flour. It is the powder made from mustard-seed with the hulls largely removed, and with or without the removal of a portion of the fixed oil. It is thought that the removal of this oil prevents to a marked degree the discoloration produced by oxygen absorption at the surface of mayonnaise. It has been found that ordinary mustards contain compounds which cause the oil to absorb more oxygen, producing rapid discoloration, which is not as noticeable where a specified mayonnaise mustard flour is used. Commercial mayonnaise mustard flour is generally packed in fibre containers, and care should be exercised to store mustard in a dry, cool place and off the floor. Pepper and other spices may be added to suit the individual manufacturer. A pasteurised mixed spice is also now available for use in mayonnaise.

The general practice with regard to the vinegar is to add a portion of it at the start of the batch and the remainder after all the oil has been emulsified. Investigations by Gray, Southwick, and Maier show that the percentage of the total vinegar and water added at the start of the batch with egg-yolk, salt, sugar, and spices has a marked influence on the consistency of the finished batch; they recommend adding vinegar at the start to the extent of about one-third of the total vinegar and water.

Campbell gives the following formula for spiced vinegar:

Spiced Vinegar for Mayonnaise and Salad Dressing.

100-" grain " white vinegar	20 galls.
Water	17 galls.
Mixed spices (see below)	13¾ lbs.
Chopped garlic	11 ozs.

Mixed Spices for the Spiced Vinegar.

Ground cayenne	1½ lbs.
Ground ginger	2 ,,
Ground clove	3 ,,
Ground mace	¼ lb.
Ground coriander	3 lbs.
Ground mustard	3 ,,
Ground cardamon	½ lb.
Ground bay leaves	1½ ozs.
Ground caraway	3¼ ,,

The spices should be leached for about one week before using in order to extract the flavour.

Two of his mayonnaise recipes are as follows:

Mayonnaise Formulæ.

Fresh egg-yolk	21 lbs.
Oil (corn, sesame, soya, olive, or cottonseed)	10 galls.
Salt	24 ozs.
Sugar	20 ,,
Mustard flour	8 ,,
Spiced vinegar	1 pint.
100-" grain " white vinegar	6 pints.
Water	2½ ,,
Powdered gum tragacanth	2 lbs. 9 ozs.

Mayonnaise.

Egg-yolks	4 lbs.
Oil	2½ galls.
Vinegar (45 grain)	1¼ quarts
Sugar	10 ozs.
Mustard (powdered)	¼ ,,
Salt	6 ,,
White pepper	½ oz.
Paprika	½ ,,
Water	1 pint
Yield	26 lbs.
Per cent. oil	67·30
Per cent. egg-yolk	15·38
Total per cent	82·68

262. *We wish to get in touch with British manufacturers of vacuum soldering machines suitable for use in connection with the tinning of hams. We should also like to know of a cheap and reliable source of supply for the necessary tins.* (London.)

The required information was furnished.

263. *A French correspondent is anxious to obtain, for statistical purposes, the prices of the following on March 15: Sifted fecula, semolina, edible salt, isinglass, ground-nut cakes.* (France.)

These prices were given.

264. *Another French correspondent asks for an account of the Scotch method of smoking haddocks.* (France.)

An excellent account is contained in a report prepared by the U.S. Commissioner of Fisheries, and a copy of this was sent to the enquirer.

265. *Having in mind the very valuable help which you have given in the past, I am prompted to ask your advice again. I should like to know of a publication which deals with the manufacture of rusks. Failing this, perhaps you could give me particulars and recipes.* (North Devon.)

We do not know of any publication which deals with this subject in an up-to-date fashion. Perhaps the following notes will be of assistance:

For the preparation of rusks a sponge ferment of the same type as is used for buns is required. For setting a ferment the following quantities are suitable:

1 quart water.
2 ozs. milk powder } or 1 quart milk.
2 ,, sugar.
3 ,, yeast.
8 ,, flour.

The milk and sugar are dissolved in water, and the yeast is broken down and the flour mixed in to produce a clear batter, which is well whisked so as to aerate it thoroughly. The temperature should be about 90° F., and the ferment should be left for half an hour. The ferment is then made into the dough. For the above quantities 4 lbs. flour, 8 ozs. butter, 6 eggs, 4 ozs. castor sugar, and ¼ oz. salt could be used; but these quantities may be varied to suit individual taste—*i.e.*, some people will prefer more sugar, and the amount of flour will depend on the quality of the flour. The dough should ferment for two hours, after which it is made into long rolls, which are batched on tins and greased between each roll. They should be baked in a moderate oven for thirty-five minutes. After they are baked they are allowed to lie for one day, when the top and bottom are rasped off and the rolls cut into thin slices and baked again in a moderate oven until thoroughly crisp and dry and of a rich brown colour.

Another very popular recipe for small mixings is as follows:

Ingredients.

2 ozs. butter.
1 oz. castor sugar.
1 dessertspoonful brewer's yeast.
1 lb. flour.
2 eggs.
1 pint milk.

The yeast is mixed with the sugar and half a teacupful of warm milk. This is poured into the centre of the flour in a deep bowl, and the whole is allowed to rise for one hour in a warm place. The sponge should then be sufficiently light, and it is mixed with the rest of the flour, the remainder of the milk, the eggs, and a little salt. The whole is beaten well with a wooden spoon, after which it is put into a greased tin and set to rise for about another hour, after which it is baked in a moderate oven. When cold it is cut into thin slices and dried in a quick oven, after having been previously sprinkled with powdered sugar.

This gives a rather richer type of rusk than the former recipe.

Wells recommends the following:

1 quart of sponge.
4 ozs. sugar.
2 eggs.
2 ozs. butter.

Mix all the ingredients together, make it up to the size of bun dough with best flour, let it lie for two hours, make into long rolls, and batch on tin. Bake in moderate oven thirty-five minutes. Allow to lie for one day, then cut into slices and bake again till crisp and brown. The sponge referred to in the above recipe is presumably prepared as follows:

For every gallon of water at 90° F., use 7 ozs. yeast and 4 ozs. salt. Dissolve the yeast in the water, then use sufficient flour to make a thin batter sponge; let this mature for half an hour, then bruise the salt and mix it through the sponge.

The important part about rusks is to serve them very crisp. If they are kept in a basket in a warm place overnight after the second baking, the crispness is increased.

266. *As you probably know, New Zealand produces dried milk on a very large scale, but so far nobody has tackled the drying of malt. At the same time, the country is hardly big enough to warrant it. Here bakers and biscuit manufacturers are using malt in their products—as malt-extract or flour—but we have not come across a milk and malt extract powder, and we should be very grateful if you could put us in contact with the manufacturer of this product, as we believe it would be welcomed in this market.* (New Zealand.)

We brought this case to the attention of Horlick's Malted Milk Co., Ltd., and received the following comments from their Foreign Sales Department:

There are fifty-one malt-houses in New Zealand, using 568,315 bushels of barley annually and turning out 12¾ million gallons of beer and stout, so there is no scarcity of malt.

The balance of wheat available for gristing into flour is 8 million bushels; whenever local production falls below 6 bushels per head of the 1½ million population, Australia supplies the deficit. Most of that 8 million bushels is used for breadmaking.

New Zealand is a very big exporter of dried milk. If, therefore, the need for an "improver" is felt, it can produce its own malt-flour and probably does, and could produce its own malt-extract if that were the form which it found desirable for its improvers. In practice, malt-extract has several advantages over malt-flour, and, in fact, millers have tried spraying their flour with malt-extract and phosphates.

Malt-extract has been used for the past quarter of a century as an improver and sold under special names such as Diamalt, Erdebamalt, Monopol, Orzil, Maltine, Unomalt, Glicorso, Sitmalt, Frammalt, etc. Possibly New Zealand imports "improvers" of this kind from Czechoslovakia, Austria, or Germany. We have no means of verifying this, but if we were interested would address the bakers' associations in New Zealand.

Milk powder, often skim milk powder, is used in breadmaking, as it supplements the proteins, especially in flours of a low gluten and high starch content. New Zealand can certainly provide this material locally in abundance with or without malt extract, viscid or desiccated. It also follows that importing an improver with a large dried milk content would not be economically sound.

It is to be distinctly remembered that the malt-extract used as an improver is a very different thing to the malt-extract found in a malted milk to the extent of some two-thirds. A bakers' malt-extract has a very high diastatic value, whereas malted milks do not claim any, and in fact have very little or nothing. In their case the diastase has already done its work. Bakers' malt-extracts have an average diastasic value of 3,500 to 5,000 as compared with the 200 to 220 of a nutritional malt-extract! Further, for some flours a high peptolytic effect is necessary, and in practice two varieties exist, high and low peptolytic, although bakers may not know them by such terms.

There may exist a mixture of dried milk and malt-extract for bakery purposes, but this is not malted milk as we understand it. Malted milks are useless for the special purposes improvers serve. They do, of course, add to the nutritive value, improve the appearance of the crust, serve with some flours as a desirable yeast food, but the absence or extreme poverty of diastasic and peptolytic value makes them useless as "improvers" and in any case very costly.

Whether New Zealand uses a malt-flour or a malt-extract liquid, viscid or dried, high diastasic or high peptolytic, depends entirely on the nature of the flour used and on popular taste.

267. *We read with interest the article in May issue of* FOOD MANUFACTURE *on the manufacture of piping jelly. Previous to the publication of this article, I had written to the author giving it as my opinion that it was necessary for the piping jelly to conform to the new standards, "Lower" and "Full Fruit Standard"; also, I wrote to the Food Manufacturers' Federation asking their opinion, and they confirmed the opinion I expressed to Mr. James Stewart. As we informed Mr. Stewart, we have been experimenting with piping jellies, and have succeeded in producing one to conform with the full fruit standard, but we find it is unsatisfactory in so far as it has not the extreme brightness which is so highly desirable in the eyes of bakers.* (Newcastle-on-Tyne.)

On this question, Mr. Stewart expresses the following views:

"Piping jellies are used by confectioners as a decorative medium, and are a different type of jelly from those made by jam manufacturers and ultimately sold for table use.

"In my opinion, so long as they are pure and suit the purpose for which they are required, there is no necessity for them to conform to the standards set up by the Food Manufacturers' Federation.

"The full fruit standard jellies do not always suit the requirements of the confectioner, as they do not always retain the form in which they are piped out because of their lack of body. In other cases they are too short and break when piped out.

"To give them smoothness and body, it is usual to add a gelatinous substance such as agar-agar solution or apple pectin. The most of the piping jellies sold to confectioners contain either of these substances, whilst others are also reinforced with gum."

268. *We should be glad of your advice concerning centrifugals for dripping. We make 1 to 2 cwts. of dripping per week, but owing perhaps to it being a mixture from all kinds of cooking, it is not uniform nor of good colour. Would a small centrifugal give us a product free from moisture and of a good colour?* (Bristol.)

Quite a number of centrifugals are being used for this job, and it has been the experience of Alfa-Laval Co., Ltd., that satisfactory results are obtained, the resulting dripping being free from both moisture and solid impurities. This firm installed an Industrial Separator in the municipal slaughter-house in Stockholm, probably the finest building of its kind. After a short period of settling, the fat is pumped to the separator at the rate of 220 gallons per hour. The fat discharged from the machine is quite clear and free from water and impurities, and is filled directly into barrels. It is generally used for the manufacture of margarine and other food products. A small machine would be suitable for your purpose.

269. *A request for recipes for thick and thin brown sauces.* (Dundee.)

These supplied.

270. *A similar request for three sauces.* (Glasgow.)

Also supplied.

271. *We shall be glad to have a good recipe for making potted beef paste suitable for sale in 1-lb. cartons, and also name and address of suppliers of preservative.* (Leicester.)

An example of recipe was supplied and the enquirer advised to get into touch with Boake, Roberts and Co., Ltd.

272. *We shall be obliged if you will kindly send us particulars of the canning of cream.* (London.)

This is a difficult operation without expert guidance (a recommendation made in this connection), as one has to avoid development of a burnt or tinny flavour. After the cream has been canned, the cans are capped by double seamer (not necessary to evacuate) and the sterilising is then carried out in an agitating type of machine. The enquirer was referred to a firm of engineers interested in the matter.

273. *Can you give us the names of a few makers of waxed cardboard discs such as are used as caps for jam jars, etc.?* (Swansea.)

Suggestions made.

274. *I should be glad to know if there is any medium we could use to mix with fine stoved vacuum salt as a drying agent, so as to keep it in a free-running condition.* (Leeds.)

We understand that table salts contain tri-basic phosphates of calcium and magnesium. One theory of their action is that they form a protective coating on the salt by adsorption.

We suggest that you obtain some very fine and dry powdered phosphate and thoroughly mix about 5 per cent. and make a trial as to its keeping qualities, and then make up other

small trial lots, using progressively smaller percentages of phosphate so as to arrive at the minimum proportions of phosphate, which will produce a salt conforming to your requirements.

275. *In view of the increased rate of duty on sugar in the Irish Free State, we would be obliged for information regarding the minimum quantity of sugar we can use in proportion to fruit in the manufacture of jams to obtain a product with reasonable keeping properties. Your advice on the addition of corn syrup or glucose, in view of its relative cheapness, would also help.* (Dublin.)

The minimum of total solids required in jams according to the policy agreed upon by public analysts and jam manufacturers is 68·5 per cent. This quantity also coincides with the amount of sugar necessary to give the maximum strength of a pectin gel. It has been shown that the keeping quality of jam depends to a large extent on the gel being firm, so that it is inadvisable to cut down the sugar to such an extent that a slack jam is obtained.

A pectin gel can be made with other sugars than sucrose —even glycerine gives one. Hence corn syrup can be used and has been used, but an excessive amount will make the gel sticky, probably owing to the presence of substances other than sugars. You can easily test this out for yourself, making the total solids in the recipe the same as if sugar only were being used. Thus, if the corn syrup contains 80 per cent. of soluble solids, then a pound of sugar can be replaced by 1¼ lbs. of glucose. You will probably find that about 10 to 15 per cent. of corn syrup may be introduced without much ill effect, although in some small-scale tests carried out by T. N. Morris it was found that even one-tenth of the sugar as corn syrup caused some slackening of the gel.

If you should want further expert advice on this matter we could not do better than refer you to T. N. Morris, who has had considerable practical experience in jam making, and has gone into the whole question from the scientific point of view.

276. *Recipes required for gravy salts and lemonade crystals.* (Cape Town.)

For the former, see last month's FOOD MANUFACTURE. As regards lemonade crystals, we quoted from recipes we gave in the June and September issues of last year.

277. *Two applications were made for sources of information on food laws.* (Manchester and Bolton.)

Suitable sources of information were recommended.

278. *Can you give us the names of any sauce manufacturers or bottlers who might be interested in importing Soy Sauce, either in bottles (similar to sample submitted) or in bulk packages?* (London.)

279. *A lemon and orange squash is prepared by extracting the crushed fruit and flaked rind with boiling water, straining, adding sugar, and heating to dissolve. Is there any likelihood of this liquid fermenting when kept for any length of time in a stoppered bottle, and will such a squash keep well in other ways*—i.e., *free from mould, etc.?* (Kent.)

Cruess and Irish, of the Agricultural Experiment Station, Berkeley, California, prepared an orange-lemon juice which kept palatable even after one year's storage. The method was as follows:

The fruit was washed and then crushed and pressed in an apple press. Four parts of the juices were mixed with one part lemon juice, and sugar was added to increase the Balling degree to 40°; about 6 lbs. of sugar per gallon of juice. The fresh, cloudy, unfiltered juices were found much superior in flavour to the clarified or filtered juices. The sweetened juice was bottled and pasteurised at 165° F. for thirty minutes. When it is to be served it is diluted with about twice its volume of water, carbonated water preferred.

Straight orange or lemon juice tends to develop a stale taste in six to eight weeks' time. It is best to extract the juice on a cone to avoid getting oil from the skins into the juice, or the fruit may be peeled, crushed, and pressed. Leave the yellow pulp in the juice as it adds flavour. Bottle and pasteurise thirty minutes at 165° F.

Orange syrup is prepared by extracting the juice and yellow pulp on cones (excluding skin oil), straining, adding 12 lbs. sugar per gallon, removing dissolved air by vacuumisation, sealing air-tight, and pasteurising at 165° F. All orange syrups tend to deteriorate in flavour on storage. The presence of air in syrup or the bottle causes the oil to oxidise and become "terpeney" in flavour.

280. *Name and address of makers of "Cascaphane" jam covers required.* (Scotland.)

Silver in the Food Industries

A COMPREHENSIVE paper on "Silver and its Application to Chemical Plant" was read by Donald McDonald, B.Sc., F.I.C., before the Chemical Engineering Group of the Society of Chemical Industry on February 13, and published in *J.S.C.I.*, 1931, p. 168, from which the following abstracts are taken:

"In the past the applications of silver to plant construction, either as a pure metal or an alloy, have been relatively small, but recently it has rapidly come forward, especially in this country and on the Continent, and is now receiving a considerable amount of attention. The properties which make it attractive are: Its freedom from oxidation, resistance to various commercial acids, remarkably high thermal and electrical conductivities, and excellent mechanical characteristics.

"In the distilled vinegar industry the use of copper, even when tinned, has not yielded universally satisfactory results, and trouble has occurred when the vinegar made in it is employed as a pickling medium. Small quantities of copper in solution, even though not toxically serious, are apt to be absorbed by light-coloured pickles, such as onions, which assume a pale green complexion highly undesirable in modern competitive display. The gunmetal or bronze taps of storage vessels give rise to discoloration and unpleasant flavour in some of the essential oils used for flavouring food, whilst in their distillation tinned copper stills and condensers produce results similar to those observed in the vinegar industry. Moreover, apart from the contamination of the product, the life of the apparatus itself is short. Fine silver stills and condensers and silver-alloy taps and cocks are being generally employed to overcome the manifold troubles experienced in these particular industries.

"In other food-preparing trades silver has found various relatively small uses, although in most of them the concentrations of acid handled are such as can be expressed only in terms of *p*H. For instance, in the milk, cider, and brewing trades it is used for siphons, pipe lines, pasteurising coils, and the nozzles of filling machines."

Financial News

The Editor cannot accept responsibility for any errors which may appear in the Financial News Section

The balance of gross profit realised by **Van den Berghs, Ltd.**, manufacturers of margarine and butter substitutes, during 1930 was £620,990, this figure registering a decline of £20,089 when compared with the previous year's trading profit, but owing to a reduction of general expenses the net profit was only £4,894 less at £462,720, this amount being arrived at after debiting £42,107 under the heading of depreciation, as against £35,513 in the previous account. From the 1929 appropriation the sum of £35,148 was brought forward, enabling the dividend of 1s. 3d. per share to be maintained. The company was registered in 1895, and in 1929 the share capital was increased to £4,137,500, all of which has been issued and paid up, comprising £450,000 6 per cent. cumulative first preference £5 shares, £1,000,000 6 per cent. cumulative "B" preference £1 shares, £1,000,000 7 per cent. cumulative "C" preference £1 shares, £937,500 15 per cent. preferred ordinary 5s. shares, and £750,000 ordinary shares of 5s. each. The preference dividends take £157,000, the preferred dividend £140,625, and the ordinary dividend £187,500, while the sum of £38,797 is carried forward to the next account. In 1919 the Dutch interests were transferred to **Van den Bergh's Fabrieken (N.V.)**, which shortly afterwards acquired other Continental interests, and whose accounts for the past financial year disclose a net profit of £506,194, enabling the "A" ordinary dividend to be maintained at 15 per cent. and the "B" ordinary dividend at 10 per cent., and the sum of £33,333 to be placed to reserve.

The 1930 accounts of **Jurgens, Ltd.**, a Unilever subsidiary, reveal a decline in the balance of net profit at £375,779 compared with £393,251 realised in 1929, although the disposable balance enables the dividend on the ordinary shares to be maintained at the rate of 7 per cent. for the third successive year, and £100,000 to be reserved. The dividend on the ordinary share capital of **Anton Jurgens' United (Margarine) Works** has been maintained at 10 per cent., the net profit for the twelve months ended December 31 last being shown in the audited accounts at £1,229,346 as compared with £1,250,788 realised during the previous year.

The general contraction of purchasing power is reflected in the final figures of **Schweppes, Ltd.**, the net profit for 1930 being returned at £145,897 as compared with £180,285 in 1929. After adding £36,231 brought in from the previous appropriation account, there was a disposable balance of £182,128, necessitating a reduction in the deferred dividend from 10 per cent. to 7 per cent. The company was registered in 1897, and has acquired a controlling interest in **Kia-Ora, Ltd.**, the authorised share capital being £1,225,000, all of which has been paid up in three classes—viz., £300,000 5 per cent. cumulative preference £1 shares, £400,000 8 per cent. cumulative participating ordinary £1 shares, and £525,000 7 per cent. cumulative participating deferred shares of £1 each. The final figures are given below:

	£	£
Brought forward from 1929	36,231	
Net Profit—year ended December 31, 1930	145,897	
Disposable Balance	£182,128	
5% dividend on £300,000 Cumulative Preference £1 Shares		15,000
8% dividend on £400,000 Cumulative Ordinary £1 Shares		32,000
7% dividend on £525,000 Cumulative Deferred £1 Shares		36,750
Reserved, etc.		50,000
Carried forward to 1931		48,378
		£182,128

There is £300,000 4 per cent. perpetual debenture stock outstanding, recently quoted at 77.

Vine Products, Ltd., experienced another set-back during the past year, the gross profit having been only £95,059, including profit on realisation of investments and other income, as against £122,807 realised in 1929. At £91,353 the balance of net profit shows a decline of £25,185, and, after adding the sum of £14,141 brought forward from the previous appropriation, the disposable balance amounted to £105,494, compelling a reduction in the rate of ordinary dividend from 20 per cent. to 12½ per cent. The company was registered in 1926, and produces wine made from imported grape juice. Issued capital comprises £200,000 in 8 per cent. cumulative preference £1 shares and £385,000 in ordinary shares of 5s. denomination, and there are no prior charges. The following is a summary of the results for 1930:

	£	£
Brought forward from 1929	14,141	
Net Profit—year ended December 31, 1930	91,353	
Disposable Balance	£105,494	
Allocated to Taxation Reserve		12,629
8% dividend on £200,000 Cumulative Preference £1 Shares		16,000
12½% dividend on £385,000 Ordinary 5s. Shares		48,125
Transferred to Reserve		12,000
Carried forward to 1931		16,740
		£105,494

The balance sheet shows the following principal items:

	Dec. 31, 1930. £
Freeholds	74,422
Plant	21,612
Stocks	184,250
Investments	37,173
Cash	11,601
Debtors	145,300
Goodwill	347,554
General Reserve	162,000
Creditors	53,212

The preference shares were recently quoted at 19s. and the ordinary shares at 6s.

During the year ended December 31 last a net profit of £31,266 was realised by the **Canning Town Glass Works, Ltd.**, to which was added £3,256, representing profit on investments, also the sum of £12,374 brought in from the previous account, giving a disposable balance of £46,896. The smaller amount at the disposal of the company necessitated a reduction in the rate of dividend from 7½ per cent. to 5 per cent. This company was registered in 1926, and specialises in the manufacture of glass bottles and containers used in the food and other industries, the authorised share capital being £400,002, of which £358,740 ranks for dividend, the final figures for the past year being balanced as shown below:

	£	£
Brought forward from 1929	12,374	
Net Profit—year ended December 31, 1930	31,266	
Profit on Investments	3,256	
Disposable Balance	£46,896	
Directors' additional Remuneration (1929) ...		150
5% dividend on £358,740 Shares of 5s. each ...		17,937
Written off Buildings and Plant		4,000
Allocated to Depreciation Reserve		5,000
Transferred to General Reserve		5,000
To Development Account		3,500
Carried forward to 1931 (subject to Directors' additional Remuneration)		11,309
		£46,896

As last year, an interim dividend of 2½ per cent. has been announced by **Birrell, Ltd.**, manufacturing and retail confec-

tioners, registered in 1924, and owning several shop properties and a factory in Glasgow. The last accounts were made up to July 19, 1930, and disclosed a profit of £48,974 as compared with £39,101 for the previous financial year, enabling a final dividend of 2½ per cent. to be paid, making 5 per cent. for the year, and the sum of £14,498 to be carried forward, after allocating £2,246 to taxation and transferring another £5,000 to the reserve, bringing the fund up to £60,000.

STOCK AND SHARE LIST

	May, 1931.	*Par Value.*	*April*, 1931.
Aerated Bread : Ord. ...	19/3	£1	17/9
6½% Pref.	21/9	£1	21/2
Apollinaris : Ord.	5/9	£1	5/10
Assoc. Biscuit : 6½% Pref. ...	23/3	£1	23/-
Avery (W. and T.) : Ord. ...	44/-	£1	47/3
5% "A" Pref.	4⅜	£5	4⅜
5½% "B" Pref. ...	20/6	£1	20/6
Benger's Food : Ord. ...	31/6	£1	31/-
6% Pref.	4⅞	£5	4⅞
Bovril : Ord.	24/2	£1	24/-
Deferred	36/3	£1	36/5
6% Pref.	23/-	£1	23/-
4½% Deb.	91	£100	91
British Aluminium : Ord. ...	28/-	£1	30/3
6% Pref.	20/-	£1	21/4
British Thomson Houston :			
7% Pref.	24/-	£1	23/4
Bucknall (H.) and Sons :			
Ord.	22/-	£5	22/-
Cadbury : 6% Pref.	24/-	£1	23/-
8% 2nd Pref.	29/-	£1	28/7
Callard, Stewart and Watt :			
6% Pref.	18/-	£1	17/9
Carrs : 6½% Pref.	21/-	£1	20/6
Cerebos : Ord.	5⅞	£1	5¾
Chivers : 6% Deb.	102	£100	101
Cinzano : 7½% Pref. ...	20/-	£1	21/6
Clark's Bread : Ord. ...	22/6	10/-	22/6
Cow and Gate : 7½% Pref.	22/9	£1	22/9
Criterion Restaurants : Ord.	6/6	5/-	6/3
Crosse and Blackwell : Ord.	1/-	1/-	1/6
7½% Pref.	7/-	15/-	9/4
6½% Deb.	88	£100	91
Dutch Margarine : 5½% Pref.	21/-	£1	21/3
English and Dutch Meat :			
8% Deb.	50	£100	40⅛
Ewart and Son : Ord. ...	16/3	5/-	16/-
16% Pref.	19/6	10/-	10/6
Foster Clark : Ord.	42/3	10/-	42/6
Fry's : 8% "B" Preferred	22/4	£1	22/4
Fullers : Ord.	34/-	£1	34/-
7% Pref.	18/9	£1	18/9
Gordon Hotels : Ord. ...	9/-	£1	11/6
4% Perp. Deb.	69	£100	69
Grape Produce :			
8% Ptg. Pf'd. Ord. ...	1/2	5/-	9d.
H.P. Sauce : Ord.	92/-	£1	94/6
Hill (W.) : Ord.	7/-	£1	7/-
Holbrooks : Ord.	14/-	5/-	15/-
5% Pref.	4½	£5	4⅝
Home and Colonial : Ord. ...	14/-	4/-	14/5
15% Cum. Ord.	49/-	£1	48/9
6% Cum. Pref.	5 11/16	£5	5⅝
Honywood Hotels : Ord. ...	1/8	2/6	1/8
8% Pref.	15/-	£1	15/-
Hovis : 6% Cum. Pref. ...	23/9	£1	23/8
Imperial Chemical : Ord. ...	15/-	£1	16/6
Deferred	3/8	10/-	3/10
7% Cum. Pref.	20/2	£1	21/-
International Tea : Ord. ...	21/8	5/-	21/6
6% 1st Pref.	23/6	£1	23/5
7% "A" Pref.	25/-	£1	25/-
Jones (R. E.) : Ord.	1/3	5/-	1/4
10% Pref.	6/-	£1	7/9
Jurgens :			
7% Cum. Partg. Pref. ...	23/9	£1	23/8

	May, 1931.	*Par Value.*	*April*, 1931.
Kia-Ora : Ord.	8/3	10/-	8/3
Liebigs : (Reg.)	11½	£5	11½
(Bearer)	11½	£5	11¼
5% Pref.	96/3	£5	95/-
Lipton : Ord.	5/2	1/-	5/4
5% 1st Pref.	8/6	10/-	8/9
6% Pref.	10/6	10/-	10/5
6% Deb.	102	£100	100
Lovell and Christmas : Ord.	11/3	£1	11/-
Lyons : Ord.	93/-	£1	94/6
"A" Ord.	92/9	£1	94/-
5% Pref.	20/9	£1	21/-
6% Preferred Ord. ...	22/6	£1	22/6
7% Pref.	27/-	£1	26/9
8% Pref.	31/-	£1	30/8
Manbre and Garton : D'f'd.	10/9	2/-	12/6
Mather and Platt : Ord. ...	30/-	£1	30/-
Maypole Dairy :			
20% Preferred	17/-	5/-	16/9
Deferred	4/5	2/-	4/6
5% Pref.	19/9	£1	19/9
Mazawattee Tea : Ord. ...	12/6	6/8	12/6
Meadow Dairy : 7½% Pref.	24/4	£1	23/9
Mellin's Food : 6% Cum. Pref.	2/3	£1	2/-
Molassine : 7% Pref. ...	11/3	15/-	12/-
Nathan (J.) : Ord.	2/2	1/-	2/3
7% Pref.	17/-	£1	16/9
8% Preferred	7/10	10/-	8/6
Nestlés : 8% Pref.	30/8	£1	30/11
Parkinson and Cowan : Pref.	21/-	£1	21/-
Pascall (J.) : 8% Preferred	6/-	£1	6/-
Peak Frean : 5% Pref. ...	19/-	£1	18/2
8% "A" Pref.	26/-	£1	25/-
Radcliffs Edible : Ord. ...	1/3	1/-	1/3
8% Pref.	7/-	10/-	7/-
Radiation : Ord.	34/-	£1	35/6
6% Pref.	22/-	£1	22/9
Rowntree : 7% 2nd Pref. ...	21/8	£1	22/8
Salt Union : Ord.	22/6	£1	26/3
7% Pref.	26/-	£1	28/2
4½% Deb.	82	£100	83
Schweppes : Deferred ...	29/-	£1	29/-
4% Deb.	78	£100	78
Scribbans : Ord.	13/5	£1	13/10
Deferred	1/8	1/-	1/10
Slaters and Bodega : Ord. ...	26/8	£1	26/-
6½% 2nd Pref.	21/6	£1	21/3
Smithfield and Argentine Meat :			
7½% Cum. Pref.	16/9	£1	18/-
Smith's Potato Crisps : Ord.	8/9	5/-	9/-
Spiers and Pond : Ord. ...	13/8	10/-	13/9
6½% Pref.	20/2	£1	21/-
5% Deb.	97	£100	97
Spillers : Ord.	27/-	£1	26/-
6% Pref.	20/6	£1	19/3
Deferred	10/-	£1	9/-
Strand Hotel : Pref'd. Ord.	65/-	£1	66/6
Tate and Lyle : Ord. ...	36/3	£1	36/-
6½% Pref.	24/3	£1	24/6
Trust Houses : Ord. ...	14/-	£1	13/7
Unilever : Ord.	36/-	£1	40/6
7% Preferred	24/9	£1	24/-
Union Cold Storage :			
6% Pref.	20/-	£1	19/3
7% Pref.	20/2	£1	21/6
10% Pref.	26/9	£1	27/-
United Caterers : Ord. ...	7½d.	5/-	11½d.
United Dairies : Ord. ...	33/6	£1	33/-
6% Pref.	22/-	£1	21/9
United Glass Bottle : Ord. ...	16/6	£1	19/8
Preferred	21/-	£1	22/-
United Molasses : Ord. ...	7/9	£1	8/9
6% Pref.	8/11	£1	9/10
Van den Berghs :			
15% Preferred Ord. ...	11/3	5/-	10/6
Victoria Wine : Ord. ...	6/8	5/-	6/8

New Companies

COLUMBIA ICES, LIMITED. (255871.) To carry on the bus. of mnfrs. and vendors of ice-cream, etc. Nom. Cap. : £100 in 1s. shares. Dirs. : F. North, 5, Abbey Drive West, Grimsby; E. Smith, 65, Cromwell Road, Grimsby; F. Cobb Allitt, 72, Farebrother Street, Grimsby.

RICHARD HICKS (COVENT GARDEN), LIMITED. (256259.) 46, Basinghall Street, E.C. 2. To carry on the bus. of wholesale and retail fruiterers, etc. Nom. Cap. : £5,000 in £1 shares.

PARKSIDE CONFECTIONERY COMPANY, LIMITED. (256128.) To carry on the bus. of mnfrs. of and dlrs. in confectionery. Nom. Cap. : £2,000 in £1 shares. Permt. dirs. : A. Evans, 4, King Edward's Road, Newcastle-upon-Tyne (chairman); W. P. Webster, Sunny West, Two Ball Lonnen, Newcastle-upon-Tyne; J. G. Dawson, Weetwood, Ponteland, Northumberland.

J. H. RAYNER AND COMPANY (COLONIAL), LIMITED. (256122.) St. Dunstan's House, Mincing Lane, E.C. To carry on the bus. of importers and exporters of and dlrs. in cocoa, coffee, tea, rubber, etc. Nom. Cap. : £100 in £1 shares.

BEST FOODS, LIMITED. (256206.) To carry on the bus. of mnfrs. and distributors of and dlrs in creams for use as sweetmeats, confectionery, or food, or as ingredients in food, etc. Nom. Cap. : £1,000 in £1 shares. Dirs. : H. E. Grosswendt, 25, North End House, Fitz-James Avenue, West Kensington, W. 14 (life dir.); J. D. Matthews, 14, Warrington Crescent, W. 9.

SHORT PASTE, LIMITED. (256101.) 22, Surrey Street, W.C. 2. To acquire and work a certain invention or process for the mnfre. of a paste used in connection with the mnfre. of pastries, etc. Nom. Cap. : £100 in £1 shares.

J. PERRY AND COMPANY (ACCRINGTON), LIMITED. (256025.) 36, Back Owen Street, Accrington. To take over the bus. of a botanical herbalist, mnfr. of mineral waters and fruit cordials, etc., cd. on by J. Perry at Accrington as "J. Perry and Co." Nom. Cap. : £2,000 in £1 shares. Dirs. : J. Perry, 16, Cromwell Street, Accrington; W. R. Perry, 16, Cromwell Street, Accrington.

TATTIS POTATO CRISPS, LIMITED. (256030.) Middlewood Road, Aughton, near Ormskirk, Lancs. To establish factories or bakeries, and to carry on the bus. of dlrs. in farm, garden, and dairy produce, etc. Nom. Cap. : £1,000 in £1 shares.

BLOSSOMFIELD DAIRY COMPANY, LIMITED. (256014.) 110, Newton Road, Sparkhill, Birmingham. To carry on the bus. of dairymen, etc. Nom. Cap. : £2,000 in £1 shares.

REA VALLEY FOODS, LIMITED. (255983.) 8, Harrington Street, Liverpool. To carry on the bus. of mnfrs. of and dlrs. in provisions, etc. Nom. Cap. : £5,000 in 4,500 pref. shares of £1 and 10,000 ord. of 1s.

J. JAMES AND SON (BOXFORD), LIMITED. (255976.) To take over the bus. of seed growers, etc., cd. on at Stapletons, Boxford, Suffolk, as "J. James and Son." Nom. Cap. : £100 in £1 shares.

A. AND H. PICKLES AND COMPANY, LIMITED. (255198.) 34, Gordon Street, Stockport. To carry on the bus. of abbatoir proprs., wholesale and retail butchers, etc. Nom. Cap. : £4,000 in £1 shares.

NEWCASTLE ARMS BREWERY, NOTTINGHAM, LIMITED. (255243.) To carry on the bus. of brewers, etc. Nom. Cap. : £20,000 in £1 shares.

LACEYS (LONDON), LIMITED. (255286.) To manufacture and merchandise Laceys reducing gum or any other form of confectionery, etc. Nom. Cap. : £100 in £1 shares.

BOTTLERS' MACHINERY, LIMITED. (255668.) To enter into an agmt. with A. L. Flower for the purchase (1) of a patent for improvement in or relating to machines or apparatus for crown corking bottles, (2) a provisional specification for a patent for applying crown corks to bottles, and (3) a provisional specification for a patent for bottle cleaning machines; to carry on the bus. of founders, brewers' engrs., etc. Nom. Cap. : £1,500 in £1 shares.

MASCOT AERATED WATERS, LIMITED. (255619.) 25, Finsbury Square, E.C. 2. To carry on the bus. of mnfrs. of and dlrs. in aerated waters, etc. Nom. Cap. : £500 in £1 shares.

EDIBLE PRODUCTS, LIMITED. (255639.) To carry on the bus. of mnfrs. of all kinds of food and edible products, etc. Nom. Cap. : £10,000 in £1 shares (6,000 pref. and 4,000 ord.).

WALTER TOWNSON, LIMITED. (255894.) To take over the bus. of a wholesale confectioner cd. on at 13, Regent Street, Blackburn, by W. Townson. Nom. Cap. : £5,000 in £1 shares.

SEFTON FARMS PRODUCTS, LIMITED. (255787.) To take over the bus. of pig dlrs. formerly cd. on at Sefton Mill Farm, Sefton, Lancs., by Sefton Mill Farms, Ltd., and lately by a receiver appointed by the debenture holders of such company. Nom. Cap. : £5,00 in £1 shares.

SALADA TEA COMPANY OF CANADA, LIMITED. (F. 2995.) Partics. filed April 15, 1931. Port of London Buildings, 1 and 2, Pepys Street, E.C. 3. Incorpd. in Canada, December 19, 1930. Formed to carry on the bus. of buyers, sellers, and packers of and dlrs. in tea, coffee, etc. Cap. Stock. : 2,000,000 dollars in 100-dollar shares. Name of person authorised to accept service : R. F. W. Burton, Port of London Building, E.C. 3.

JOSEPH BROWN AND SONS, LIMITED. (254108.) 33, Murray Street, Burnley. To carry on the bus. of wholesale or retail fruit and potato mchts., etc. Nom. Cap. : £2,000 in £1 shares. Gov. dir. : J. Brown, 33, Murray Street, Burnley. Qual. of dirs. : 100 shares. Remun. of dirs. : As voted by the company.

Recent Practical Applications of Dry Ice

(*Continued from page* 169.)

machine, so that the dry ice powder produced falls directly into the ice-cream mix, which is stirred during the process in the pan of the mixer. The pan should be filled only to about one-third capacity, as freezing is very rapid, on account of the intimate contact of the dry ice and the mix,

and considerable stiffening takes place in a few seconds. The weight of dry ice used is less than five pounds to the gallon, and the ice-cream produced is said to be very smooth on account of its rapid freezing. This is a process which is certain to attract increasing attention.

Current Literature

Fruit and Vegetable Products

170. Orange Juice and the Dairy Industry. F. R. Fisher. (*Fruit Products Journ.*, 1931, April, p. 238.)

171. Relation of *p*H Value and Preservative Action. W. V. Cruess. (*Ibid.*, p. 243.)

172. Suspension of Fruit Pulp in Syrup. S. Blumenthal. (*Ibid.*, p. 245.)

173. Suggestions for Utilising Surplus Fruits. W. V. Cruess. (*Ibid.*, p. 247.)

174. Freezing Storage Practice for Fruits and Vegetables. G. L. Marsh. (*Canner*, 1931, May, p. 13.)

175. Determining the Tenderness of Fruits and Vegetables. (*Ibid.*, p. 19.)

Cereal Products

176. Refrigeration in the Cereal Beverage Plant. F. W. Rabe and R. W. Bussen. (*Food Industries*, 1931, May, p. 194.)

Dairy Products

177. Temperature Control in Ripening Cheese. R. F. Flint. (*Food Industries*, 1931, May, p. 184.)

178. Refrigeration in the Milk Industry. J. Kirkup. (*Ibid.*, p. 192.)

179. Milk and Milk Products in the Candy Industry. (*Manufacturing Confectioner*, 1931, April, p. 53.)

Miscellaneous

180. Fumigation with Ethylene Oxide. J. M. Russ. (*Industrial and Eng. Chem.*, 1931, p. 328.)

181. Synthetic Vanillin. J. Schwyzer. (*Chemik. Zeitung.*, 1931, p. 817.)

182. Refrigeration and Ice-Cream Quality. A. H. Bayer. (*Food Industries*, 1931, May, p. 182.)

183. Refrigeration expands Beverage Industry. (*Ibid.*, p. 186.)

184. Refrigeration and Meat Curing. C. R. Moulton. (*Ibid.*, p. 193.)

185. Refrigeration in the Chocolate Factory. J. P. Cyphers. (*Ibid.*, p. 198.)

Analysis

186. Determination of the Milk Proteins. G. M. Moir. (*Analyst*, 1931, April, p. 228.)

187. Constitution of Dried Milk Powder. L. H. Lampitt and J. H. Bushill. (*J. Soc. Chem. Ind.*, 1931, p. 45.)

188. Determination of the Ash of Bread. F. Bernardini and E. A. Gauthier. (*Giorn. Chim. Ind. Appl.*, 1931, p. 7.)

189. Essential Oils from Grain Germans. (*Perf. Essent. Oil Rec.*, 1931, 22, p. 38.)

190. Oleic Rancidity of Fats. K. Taufel and J. Muller. (*Z. Unters. Lebensm*, 1931, 60, p. 473.)

191. Analysis of Hops. W. Wollmer. (*Allgem. Brauer und Hopfen-Z.*, 1930, 70, p. 1531.)

192. Anti-scorbutic Fraction of Lemon Juice. S. S. Zilva. (*Biochem. J.*, 1930, p. 1687.)

Report on the Marketing of Honey and Beeswax in England and Wales. Economic Series No. 28. Ministry of Agriculture and Fisheries. 1931. Pp. 92. Price 6d. (postage extra). H.M. Stationery Office, London, W.C. 2.

We welcome the publication of another addition to the series of admirable marketing reports issued by the Ministry of Agriculture and Fisheries. This has been prepared, following a detailed investigation of the marketing of honey in England and Wales and of current practice abroad, to afford a basis on which to plan an improved marketing technique.

The estimated wholesale value of honey produced annually in England and Wales in recent years approaches £200,000. This is a fairly considerable figure. Nevertheless, honey production in this country is a much less important branch of rural activity than in many other parts of the Empire; moreover, the consumption of honey in this country is exceptionally low in relation to the population. Climatic and other conditions being favourable, there would thus seem to be scope for a substantial development of home production.

Unfortunately, the present methods of marketing the home product militate against the possibility of increasing the home producer's share of the trade in the big consuming centres. Honey marketing by bee-keepers is carried on along individualistic lines; examples of endeavour to standardise the product are few, and there is a serious lack of organisation for the marketing of the product.

For further comments, see the Editorial columns of this issue.

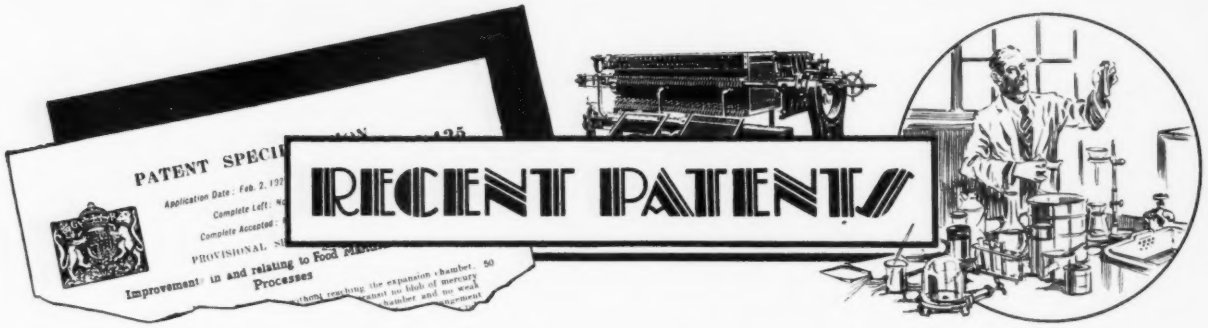
Final Report on the Third Census of Production of the U.K. (1924). *The Food, Drink, and Tobacco Trades and the Clothing Trades.* Pp. 353. 1931. Price 5s. 6d. (postage extra). H.M. Stationery Office, London, W.C. 2.

The publication of this extremely useful compilation will be welcomed by the industries concerned. The following statistical sections will be of special interest to food manufacturers: grain milling; bread and biscuits; cocoa and sugar confectionery; bacon curing and sausage; preserved meat, fish, fruit, and vegetables, pickles and sauces; butter, cheese, condensed milk, and margarine; fish curing; cattle, dog, and poultry foods; ice; sugar and glucose; brewing and malting; aerated waters and cider.

We looked for some data on fruit canning, but there was nothing beyond a statement that the U.K. production of "fruit preserved without sugar (tinned or bottled)" was 57,000 cwts., valued at £215,000, and of "fruit in thin or thick syrup (tinned or bottled)" was 55,000 cwts., valued at £241,000. Also on page 93 it is stated that "the output of tinned or bottled fruit preserved without sugar, and of fruit preserved in syrup, forms only a very small proportion of the quantities consumed in the U.K., the retained imports of the former being 384,000 cwts. in 1924, and of the latter 1,417,000 cwts. (not including 582,000 cwts. of pineapples), while British exports were respectively less than 4,000 cwts. and 3,000 cwts."

As regards fish canning, we read: "The tinned fish produced in 1924 consisted mainly of herrings, and nearly 117,000 cwts. out of the total output of 132,000 cwts. were exported; of approximately 19,000 cwts. of other fish tinned, over 14,000 cwts. were exported. Retained imports of tinned herrings in 1924 were over 25,000 cwts. and of other fish and shellfish (including salmon, sardines, and brisling) nearly 73,000 cwts."

Who has the detailed canning statistics for last year? The E.M.B., No. 37, gives the following estimates of home-grown fruits canned in England and Wales: 1928, 96,000 cwts.; 1929, 166,000 cwts.; 1930, 291,000 cwts.



These particulars of New Patents of interest to readers have been selected from the Official Journal of Patents, and are published by permission of the Controller of H.M. Stationery Office. Copies of the above may be obtained from the Patent Office, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Latest Patent Applications

11750. DUNNETT, H, and STEWART, J. Y.: Means for supporting food while being cooked. April 21.

12166. HIRT GES., R.: Food preparations. April 24.

11615. HORLICK, W.: Manufacture of food compounds. April 20.

12311. POORE, P., and TOWNSEND, C.: Preserving, etc., foodstuffs. April 25.

10971. BARROW, L.: Canning fruits, vegetables, etc. April 14.

Specifications Published

346,794. EPSTEIN, A. K.: Egg products and processes for producing the same.

346,908. CLAASSEN, DR. H.: Manufacture of yeast.

346,276. KERR, J. L.: Manufacture of margarine and other manufactured fatty predominating substances.

346,390. AURICCHIO, A., and AURICCHIO, E.: Cheeses.

346,520. CLARK, G. M. (STELLA, J. F., and TESSIER, L.): Preservation of foodstuffs.

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2., at the uniform price of 1s. each.

Abstracts Published

340,622. **Preserving milk.** HELLERUD, R., 79, Ullevaalsvei, Oslo, Norway.

Milk is preserved by heating it to 70° to 90° C., homogenising it at this temperature and then subjecting it to two or more pasteurisations with an interval or intervals between of sufficient duration and under suitable conditions for development of any spores present. The homogenisation is effected at 150 atmospheres' pressure or over, and may be followed by a second homogenisation at a lower pressure—*e.g.*, 75 atmospheres. The homogenisation may be at a lower pressure down to 25 atmospheres, providing it is repeated. The pasteurisation may be carried out by heating the milk to 67° C. or over for an hour, then keeping it at 40° C. for a day, and again heating it to 67° C. for an hour. Where a long preservation is desired, the milk is again kept for a day at 40° C. and then heated as before. The temperature of 40° C. is, in a modified form, maintained only for about four to five hours, the milk being left at room temperature for the remainder of the period.

340,637. **Yeast.** ELION, L., and ELION, E., 35, Duinweg, Den Haag, Holland.

Yeast is improved in quality and its swelling power is increased by suspending it in a nutrient solution consisting, for example, of fermentable carbohydrates, nitrogen, and phosphorus-containing substances, the fermentation being regulated by the introduction of air or its components, and the propagation of the yeast, whilst permitted, being limited in known ways other than by regulating the aeration. Such ways include the use of high concentration of nutrients and/or of yeast, raising or lowering the temperature at which the process is carried out and adding disinfectants. The result may be obtained gradually by successive treatments.

Recent Trade Marks

This list of Trade Marks of interest to readers has been selected from the "Official Trade Marks Journal," and is published by permission of the Controller of H.M. Stationery Office. Copies of the above may be obtained from the Patent Office, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

TRIFOLIUM.—508,095. **Cheese.** TRIFOLIUM (THE DANISH ESTATES' BUTTER FACTORY) ANDELSSELSKAB, 7-11, Fabrikvej, Copenhagen F., Denmark. May 6. (By Consent.)

SOLO.—520,098. **Non-alcoholic fruit essences.** SOLO ORCHARDS, LTD., 4, Brewers Lane, London, W.C. 2. May 6. (By Consent.)

SWEDET.—520,277. **Biscuits and rusks.** LEWIS A. MAY (PRODUCE DISTRIBUTORS), LTD., 52, Queen Victoria Street, London, E.C. 4. May 6.

VITACREAM.—519,919. **Wrapped toffee made with or containing cream.** MACFARLANE, PATON AND CO., LTD., Rhinsdale Preserve Works, Main Street, Baillieston, Glasgow. May 6. (By Consent.)

HONEY GIRL.—520,384. **Butter, cheese, margarine, condensed milk, eggs, and edible fats.** MORRIS ISRAEL, 73a, New Road, London, E. 1. May 6.

TWO STAR.—520,502. **Confectionery.** GEORGE PAYNE AND CO., LTD., 21 to 24, Queen Elizabeth Street, Tower Bridge, London, S.E. 1. May 6.

KOSHANPARVE.—521,324. **Table jellies, custard powders, blancmange powders, marmalade, and jam.** The firm trading as STOLBERN KOSHANPARVE PRODUCTS, 308, Oxford Street, London, E. 1. May 6.

BLUEBIRD.—521,504. **Tea.** GEORGE PAYNE AND CO., LTD., 21 to 24, Queen Elizabeth Street, Tower Bridge, London, S.E. 1. May 6.

KREMSIL.—521,812. **Concentrated marshmallow for use in filling cakes and confectionery.** SMITH HAYDEN AND CO., LTD., Cambrian Works, Morden Hill, Lewisham, London, S.E. 13. May 6.

STIMULADE.—519,592. **Soup cubes, soup essences, and preparations in tablet form for making beverages.** LEWIS A. MAY (PRODUCE DISTRIBUTORS), LTD., 52, Queen Victoria Street, London, E.C. 4. April 29.

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